

A photograph of a forest fire. A road with double yellow lines leads into the distance, flanked by tall evergreen trees. Thick smoke rises from the road, obscuring the view. Bright orange flames are visible on the left side of the road, and smaller fires are visible further down the road on both sides.

Davis Fire Rapid Assessment

**Crescent Ranger District
Deschutes National Forest
July 2003**

Davis Fire

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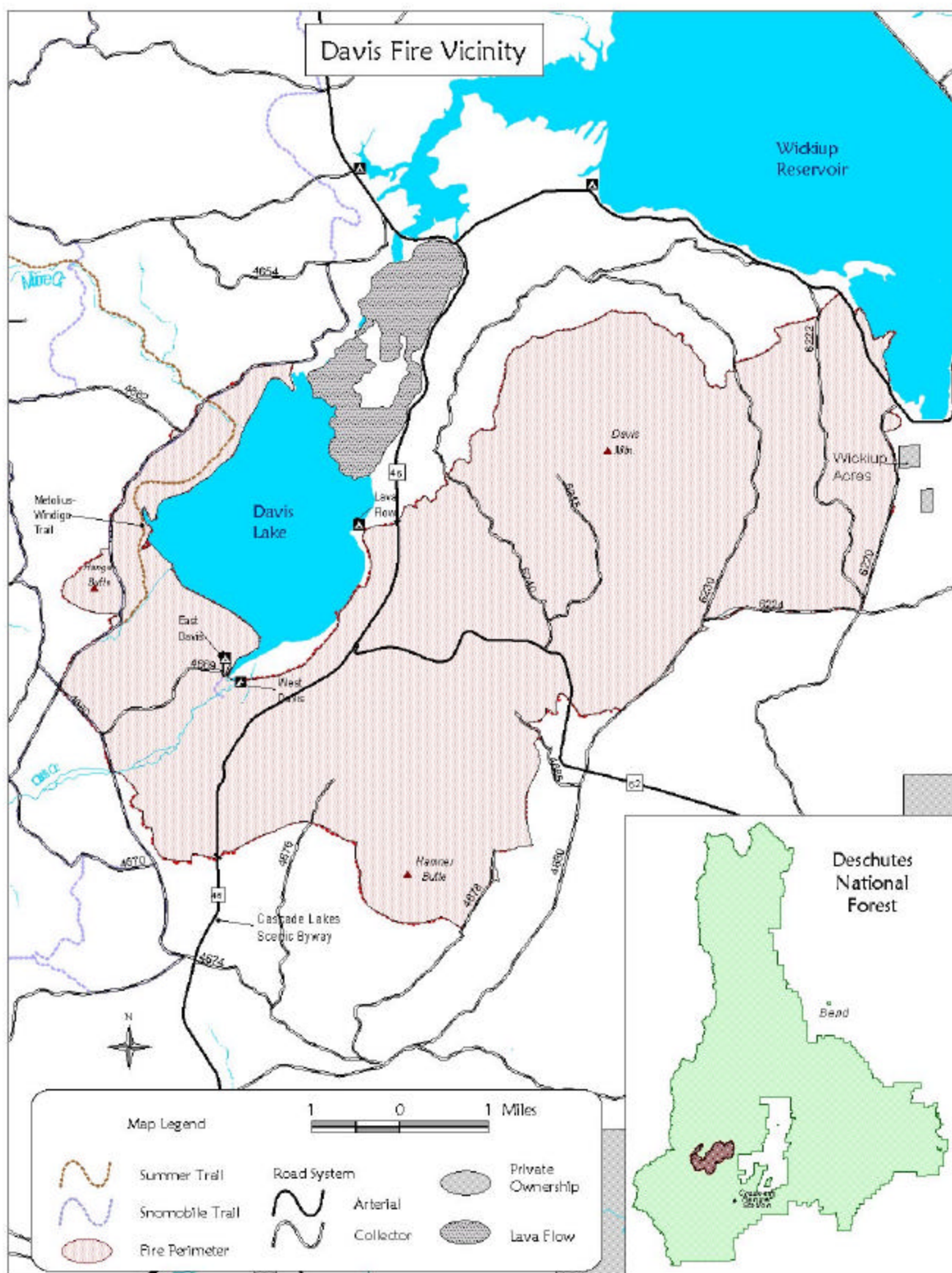


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Chapter 1 - Overview

INTRODUCTION

This report documents the Davis Fire Rapid Assessment that was conducted following the Davis wildfire of 2003 that occurred on the Crescent Ranger District, Deschutes National Forest. A multidisciplinary team of specialists developed this assessment.

The purpose of this document is to:

- Provide an assessment of the fire's effects on the landscape
- Provide a context for future actions that may be taken to address the fire's effects and reach desired conditions
- Facilitate program and budget development by recommending priorities for needed management actions
- Suggest general guidelines to protect and maintain physical and biological resources
- Recommend monitoring strategies and research opportunities

AREA SETTING

The fire area is located approximately 10 miles west of LaPine, Oregon in Klamath and Deschutes Counties. The nearest residential area is the small Wickiup Acres development at the eastern edge of the perimeter. Several recreation sites are in the vicinity, and the Cascade Lakes Scenic Byway bisects the fire area.

The fire perimeter takes in forested land ranging in elevation from 4300 to 7100 feet. The landscape is dominated on the western side by two stratovolcanoes and on the eastern side by a lodgepole flat and the area around Davis Lake. Two perennial streams are within the fire perimeter, both draining into Davis Lake. Precipitation is primarily in the form of snow during the winter months, and the amount varies sharply depending on elevation.

MANAGEMENT DIRECTION

The fire occurred on National Forest System lands, with guidance for management activities provided by the Deschutes National Forest Land and Resource Management Plan of 1990 (Forest Plan). The Forest Plan establishes goals, objectives, standards, and guidelines for each specific management area of the Forest. The fire affects the following Management Areas: Bald Eagle, Davis Lake Special Interest Area, Old Growth, Intensive Recreation, General Forest, and Scenic Views (SV) Retention Foreground, SV Partial Retention Foreground, and SV Partial Retention Middleground.

LRMP Management Area	Acres within Fire Perimeter	%
Bald Eagle Management Area	3,466	16%
General Forest	7,541	36%
Intensive Recreation	2,91	1%
Old Growth	286	1%
Special Interest Area (Davis Lake)	1,029	5%
Scenic Viewsheds	8,423	40%

In 1994, the Record of Decision for amendments to the Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl (Northwest Forest Plan) amended the Forest Plan and much of the area became Late Successional Reserve (approximately 60% of the fire area was LSR). The remainder of the area is Matrix and Administratively Withdrawn, which corresponds to the Davis Lake Special Interest Area. (*see map page 5*).

Northwest Forest Plan Allocations

Land Allocation	Acres within Fire Perimeter	%
Late Successional Reserve	11,820	56%
Matrix	6,425	31%
Administratively Withdrawn	1,020	5%
Outside NWFP	1,735	9%

FIRE BACKGROUND

The Davis Fire burn area is located 10 miles West of La Pine, Oregon, on the Deschutes National Forest. The fire started on June 28, 2003 at about 3:30 p.m., south of West Davis Campground in Central Oregon. The fire was determined to be human caused and started in an area of heavy dead and down fuels in lodgepole pine and bitterbrush. Due to low humidity, strong winds, and high temperatures, the fire quickly exhibited extreme fire behavior with multiple fire whirls, spotting out to ½ mile, and crowning.

The fire spread rapidly to the east on June 29th, threatening the Wickiup Acres subdivision. A burnout operation took place on June 30th to stop the fires spread into the subdivision. Burnout operations also took place on Hamner Butte and Davis Mountain. Little to no fire growth occurred after the 4th of July, and it was considered contained on July 8th. The fire burned approximately 21,000 acres before it was reported contained on Sunday, July 6, 2003.

POST-FIRE ACTIVITIES

This Rapid Assessment is part of the overall process to rehabilitate and recover from the fire's effects. Two other processes are also involved. This includes the Fire Suppression Rehabilitation activities and the Burned Area Emergency rehabilitation process.

Fire Suppression Rehabilitation Activities

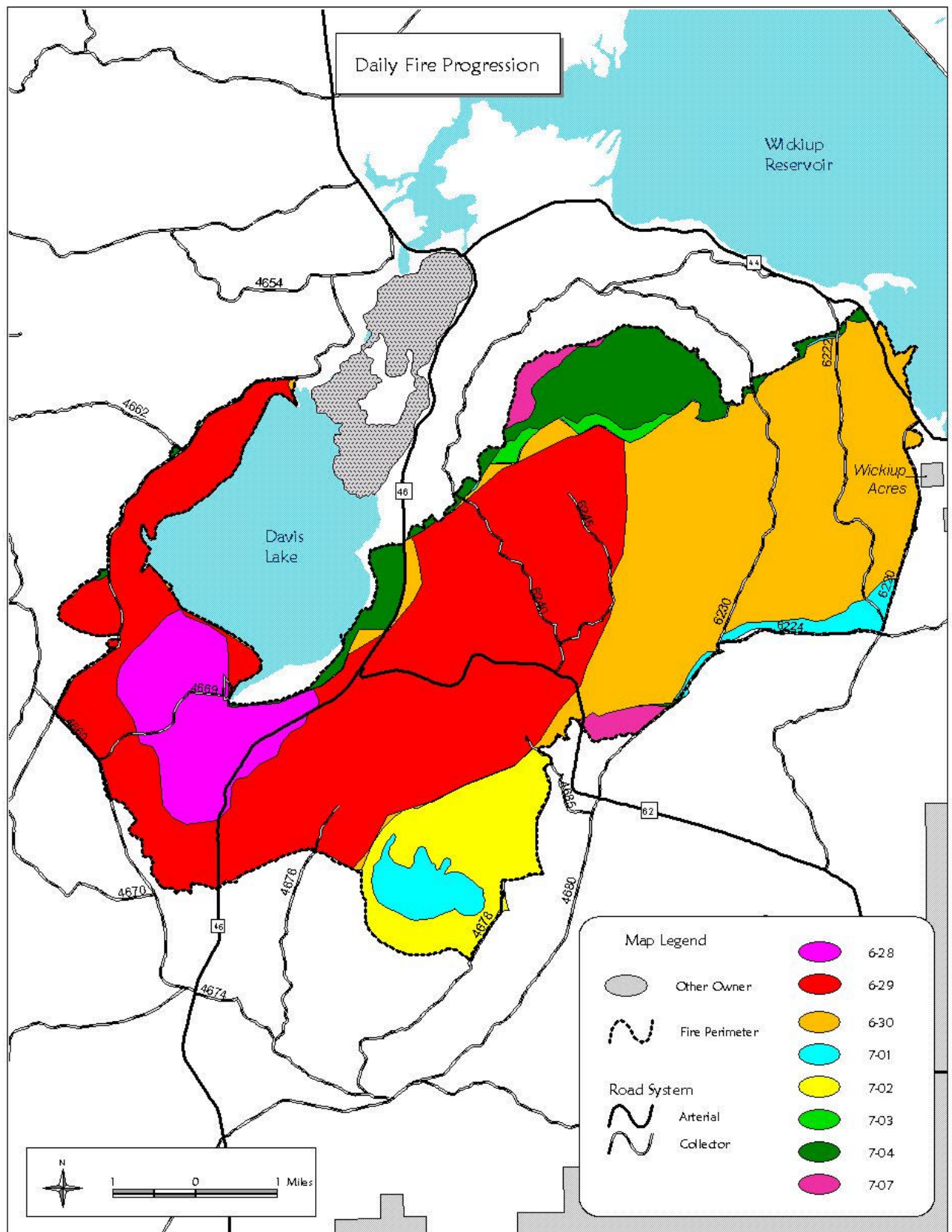
The fire suppression command team has the responsibility to rehabilitate all damages caused by suppression activities. The funds for this rehabilitation come from the same source as the funds used to fight the fire. Fire suppression rehabilitation for the Davis Fire is currently in progress. It includes rehabilitation of all dozer and hand lines, drop points, safety areas, road surfaces, and some road drainage structures.

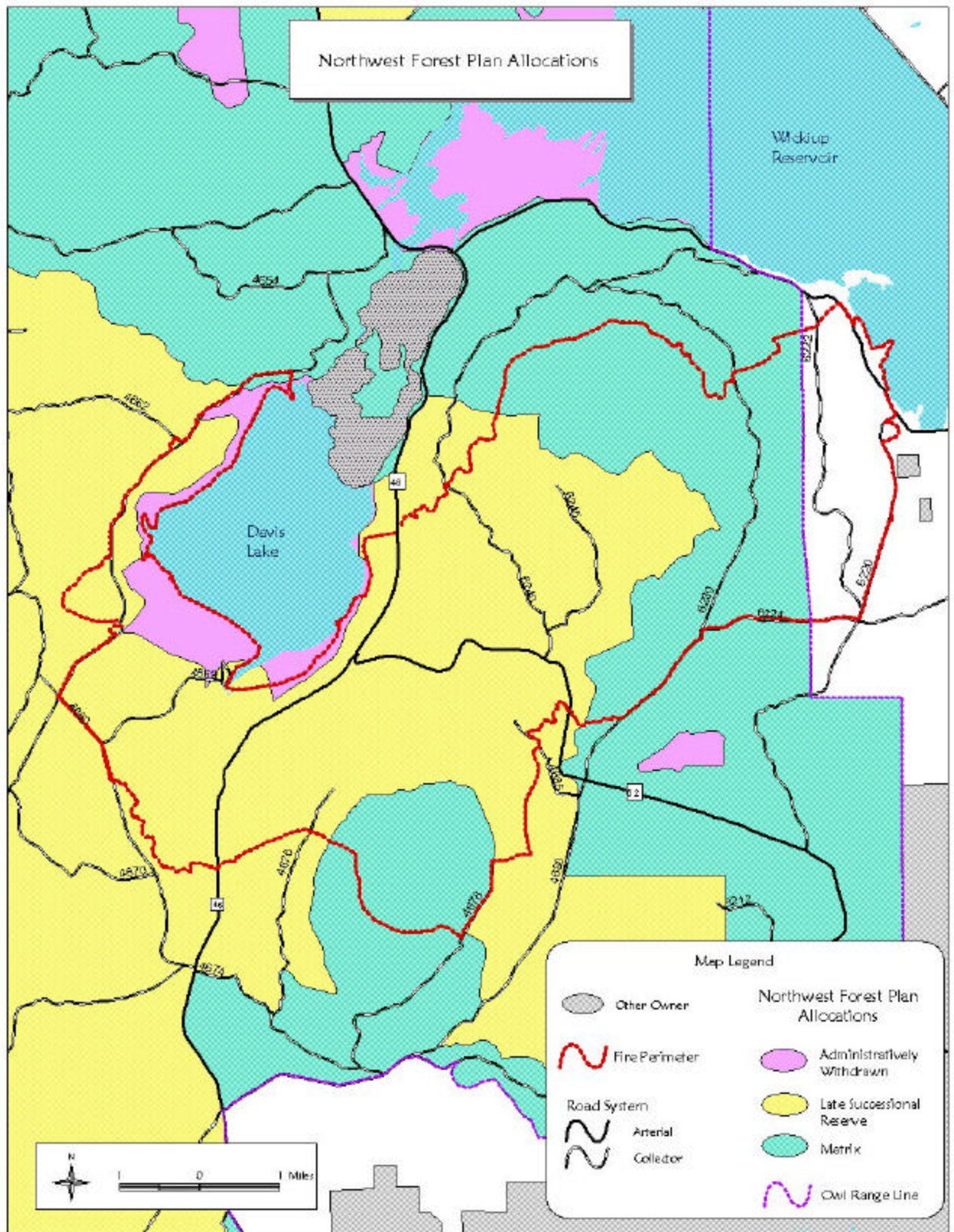
Burned Area Emergency Rehabilitation (BAER) Process

Immediately following the Davis Fire, a Burned Area Emergency Rehabilitation (BAER) team met to evaluate threats to resources, property, and human life. BAER funding may be used for treatments on National Forest Systems lands to reduce the post-fire emergency to these values at risk. Values at risk include road erosion and sedimentation, spread of noxious weeds, and safety of forest users.

After conducting field surveys to identify impacts, the BAER team concluded that no emergency treatments were necessary. After identifying and evaluating the values at risk, the team compiled the following recommendations:

- Treat noxious weeds by hand pulling and spot spraying and monitor established populations within perimeter.
- Patrol roads after storm events checking culverts or other drainage features for problems in areas of moderate burn severity.
- Establish photo points along Odell Creek to monitor vegetative recovery in riparian areas and necessity of planting.





Chapter 2 – Resource Assessments

WATERSHED/HYDROLOGY

Pre-Fire Condition

Watershed

The Davis Fire occurred mostly in the Upper Deschutes 5th field watershed, Hydrologic Unit Code (HUC) # 3170730102, but also occurred in small portions of Crescent, HUC # 17070302, and Little Deschutes 5th field, HUC # 1707030203 watersheds. The fire burned in eight 6th field subwatersheds, as shown in the following table.

6th Field Subwatersheds Affected by the Davis Fire

6th Field Subwatershed	Subwatershed Name	Total Subwatershed Acres	Percent of Subwatershed within the Fire Perimeter
170703010202	Middle Odell Creek	13,830	23
170703010203	Moore Creek	14,748	<1
170703010204	Lower Odell Creek	22,505	37
170703010206	Davis Creek	17,639	7
170703010207	Wickiup Reservoir	26,964	17
170703020206	Middle Crescent Creek	18,051	1
170703020207	Lower Crescent Creek	26,964	2
170703020301	Hamner Butte	13,360	27

Precipitation and Climate

Davis Lake Fire lies just east of the Cascade Crest. Elevations within the fire area range from 4,400 feet above mean seas level (msl) at Davis Lake to 7,098 feet at the summit of Hamner Butte. The climate is considered a Pacific Marine influence with most of the precipitation coming in the form of snow between the months of October-May. As a result of moist pacific marine air rising over the crest of the Cascade Range, annual precipitation can be as high as 80 inches in the upper elevations near the Cascade Crest and as low as 24 inches at lower elevations to the east. Heavy snowpacks are common, but are dependent upon winter air masses coming from the Pacific Ocean. Most winter air masses come in from northern areas in the Gulf of Alaska bringing cooler temperatures and usually snow during winter months. Occasional tropical winter storms bring moist, warm air from the South Pacific, which can cause extreme peak flows due to rain on snow events. Surface delivery of rain coupled with rapid melting of the snow pack can quickly deliver significant volumes of water to the channel in a short time.

Streamflow

Stream density in the Davis fire area is low due to the highly porous glacial and Mazama ash that blankets the area. Areas of steep relief are volcanic cones Hamner Butte, Davis Butte and Ranger Butte, which are also comprised of very porous material making drainage patterns non-existent.

There are two perennial streams and one ephemeral stream located in the Davis Fire area. The largest with the most significant flow into Davis Lake is Odell Creek. Odell Creek originates from Odell Lake to the southwest and flows approximately 7.5 mile to Davis Lake. Odell Creek flows in water year 2002 are: Total, 21,388 cubic feet per second (cfs), daily mean 78.3 cfs, maximum flow 249 cfs, minimum flow 53 cfs, this totals to 42,420 AC-FT. Stream flow at the time of the fire was approximately 74 cfs.

Ranger Creek is a small spring-fed creek that flows from south to north for approximately 1 mile and enters Davis Lake at the southwest corner. Stream flow data is unavailable.

Moore Creek is an ephemeral stream that flows from west to east and enters Davis Lake on the west side. Melting snow pack in the spring initiates stream flow, which typically ceases by June. There was no flow in Moore Creek at the time of the Davis Fire.

Water Quality

Odell Creek and Crescent Creek are listed on the 2002 303(d) list as “Water Quality Limited” by the State of Oregon (ODEQ 2002). Odell Creek, including the reach within the fire perimeter (FS road 4660 to Davis Creek, approximately two river miles), is listed for temperature exceedences above the standard set for salmonid rearing (64° F) and spawning (55° F). Crescent Creek is listed for temperature exceedences above the standard set for salmonid rearing; however, neither the mainstem of Crescent Creek nor any of its tributaries are located within the burn area.

Wetlands and Floodplains

Mapped wetlands are scattered in and adjacent to Davis fire area. Most occur along Odell Creek, Ranger Creek and the surrounding area next to Davis Lake.

East Davis and West Davis campgrounds are outside the 100-year floodplain of Odell Creek, and there is only an ephemeral channel near the Lava Flow campground facility. With the exception of the Lava Flow campground, which is outside the fire perimeter, these facilities are in flat areas of low burn severity.

Fisheries

There are three fish-bearing (class 1 or 2) streams within the burn perimeter, two of which are perennial. Fish species known to currently inhabit lower Odell Creek, or to have occurred there in the recent past include bull trout *Salvelinus confluentus*, redband trout *Oncorhynchus mykiss* and mountain whitefish *Prosopium williamsoni*. Largemouth bass (*Micropterus*) have been illegally introduced into Davis Lake at some time within the past century (Odell Watershed Analysis 1999). Historically bull trout inhabited Davis Lake and Odell Creek, though they have not been documented in the lower reach of Odell Creek since 1979 (USDA Forest Service 1999). Bull trout have recently been documented in upper Odell Creek, near the outlet of Odell Lake, which is outside the burn area of the Davis Fire (Odell Watershed Analysis 1999). It is believed that bull trout may use Odell Creek for foraging and possible spawning in cold-water tributaries (Odell Watershed Analysis, 1999). Redband trout are the dominant fish species in Odell Creek. Bull trout are a federally listed threatened species while redband trout are on the Regional Forester's sensitive species list.

Fish-bearing Streams within Davis Fire Burn Perimeter

Stream	Flow Regime	Stream Class
Moore Creek	Intermittent	2
Odell Creek	Perennial	1
Ranger Creek	Perennial	1

Soils

The primary soils within the fire perimeter consist of moderately deep to deep layers of pumiceous ash from Mt. Mazama over older soils. Surface textures are generally sandy loams and loamy sands with sandy loams in the older buried soil. The primary upland soil types within the fire perimeter as mapped by the Deschutes National Forest Soil Resource Inventory are map unit 98 (11,992 acres), which covers the majority of the central fire area located between Davis Mt. and Hamner Butte, and map unit 96 (2,103 acres), which covers the basin surrounding the southern half of Davis Lake. Both were originally classified as Typic Cryorthents in the cindery, mixed family but would likely fall into the ashy glassy xeric Vitricryand classification within the Andisol order.

Post-Fire Conditions

Watershed

The fire was mainly concentrated in Hamner Butte, 3607 acres, Wickiup Reservoir, 4,584 acres, Middle Odell Creek, 3,180 acres, and Lower Odell Creek that had the majority of the fire concentration at 8,326 acres. The remaining 6th Fields watersheds, Moore Creek, Davis Creek, Middle Crescent Creek, and Lower Crescent Creek only had small portions of there areas was affected by the fire.

Stream Flow

Ranger Creek is a spring-fed system with very stable flows and the entire length occurs within the burn area. Bank erosion is minimal in Ranger Creek. Therefore, bank erosion in both Odell and Ranger Creek would not likely increase because overland flow would be minimal and stream flows would remain relatively stable.

Water Quantity and Peak Flows

Three types of precipitation runoff events can occur in the Davis Fire burn area: snowmelt, rain-on-snow and convective. Snowmelt runoff is not of concern as it is a low intensity, long duration event. Rain-on-snow runoff could occur, particularly if significant frozen ground develops. However, this type of event typically has a long recurrence interval and thus is only of nominal concern. Convective events, which are of short duration and high intensity, occur regularly in this area during the summer months and are known to result in erosion and flooding. Therefore, the convective type is the main concern within this burn area.

Water Quality

There is a potential for post-fire storm flow to contribute ash and erode soil to Odell, and Ranger Creeks stream channel, which could increase pH and ammonia. However, due to the high porosity soils, flat topography, and woody material on the ground, along with new growth of vegetation this will be limited to areas directly adjacent to the stream channels.

Stream temperature in Odell Creek is expected to slightly increase following the fire. Approximately two miles of Odell Creek lie within the fire perimeter; through this reach the channel is characteristically wide and shallow with moderate amounts of instream woody debris. From approximately river mile 1.0 to 1.5 the channel is braided through a flat, which appears to be an old marsh area. Prior to the fire, vegetation was abundant within the riparian corridors (approximately 300 ft), including alder and lodgepole pine. However, it appears that lodgepole pine has encroached upon the inner riparian area within the past century, likely as a result of fire exclusion. The vegetation within this corridor provided approximately 35% of the shade along Odell Creek (USDA Forest Service 1999). All of this vegetation was completely burned (high intensity) during the Davis Fire (Table 6). Stream temperature in Ranger Creek would be minimally affected by the reduction in shade because temperature is primarily influenced by the springs. In addition, surface water would have little time to heat due to solar radiation as the stream is only one mile in length.

The only water quality or fish habitat value at elevated risk due to the Davis Fire is water temperature; however, the amount of risk is unknown.



Example of erosion along lower Odell Creek resulting from the Davis Fire



Characteristic Burn Pattern Along Odell Creek

Riparian Areas and Floodplains

Due to high porosity soils, the fire will not adversely impact wetlands. The impacts will be short term and should be beneficial as this is a process has occurred long before the area was settled and developed. There may be an increase in flows on the floodplains but the floodplains are such that it should be able to absorb the flows with out much of an increase in flood elevation. For example, on Forest Road 4660-400 (Ranger Creek Road), there is more standing water than before the fire.

At the time of the fire, Odell Creek was bordered by a riparian area, which was dominated by a dense stand of lodgepole pine with sparse amounts of willow and alder near the stream. Immediately adjacent to the stream flow, grasses, sedges and other herbaceous plants lined the channel. Moderate amounts of woody debris could be found within the channel, more so between river miles 1.0 and 2.0

where the channel was less incised and could easily access its floodplain. Downstream of river mile 1.0 in channel wood was more scarce and did not contribute as much to channel complexity or function.

The lodgepole stand was nearly completely burned, while instream wood and riparian grasses survived, relatively unharmed. In areas where the grasses had burned, they have already begun to re-sprout. However, many of the remaining willow clumps and alder trees in the vicinity did not survive.

Between river miles 1.0 and 1.5, Odell Creek becomes braided, with four channels spreading across a broad, flat fan. Old beaver chews, dams and caches of sticks evidenced past beaver activity within this area. A very dense stand of lodgepole pine had encroached and become established on this fan, which was likely previously an old beaver marsh area dominated by aspen, willow, cottonwood, alder, grasses, sedges and other herbaceous ground covers. Through the re-establishment of these species and the abundant amount of wood likely to be recruited from dying trees, the riparian area and marsh can be restored to a healthy, functioning condition.

Lodgepole pine had also encroached upon and become established alongside the mainstem of Odell Creek where it returns to a single thread channel, next to side channels and marshes. As with the braided portion of stream described above, the burning of the lodgepole pines affords us with an opportunity to restore the riparian habitat and function. Areas such as the one pictured below were likely wet, marshy areas during previous centuries. Through the removal of riparian trees and stream clean-outs, it appears that the channel has experienced a slight degree of down-cutting, which has left areas such as this one dry during low flow periods. The subsequent drying has allowed coniferous trees to become established in an area, which again was likely dominated, by deciduous trees and grasses.

The relative scarcity of instream woody material between river miles 0 and 1.0 has contributed to the degraded stream channel and riparian conditions. As alluded to above, inadequate amounts of functioning instream woody debris/logjams has resulted in a slightly degraded stream channel, which is more homogenous with fewer quality pools. Additionally, this results in a reduction in floodplain connectivity and a slight drop in elevation of the water table, which has dried marsh areas, allowing coniferous trees to become established.



Burned lodgepole pines along braided portion of Odell Creek and re-establishment of grasses under the burned trees



Burned lodgepole pine trees and willow clumps on Odell Creek floodplain

Upstream of river mile 1.0 there are sufficient amounts of instream woody material to accumulate and retain the significant amount of wood that will likely be recruited to the stream channel as burned trees die and fall over. Below river mile 1.0 however, a large amount of woody debris will probably be transported through the reach, down to Davis Lake before logjams become re-established.

Soils

Burn Intensity

The Davis fire burned as two primary events, the first as a fire whirl influenced run within the lodgepole pine basin south of Davis Lake and the second as a wind driven run to the northeast. The fire burned under moderate temperatures and relatively severe ground winds estimated at 20 to 30 mile per hour with ridge winds of 30 to 50 miles per hour during these runs. The fire areas to the north, east and south of the wind driven run were back-burned from roads under less severe wind and moderate temperatures.

Burn intensity mapping was derived from satellite imagery and is described as high, moderate, and low. Burn intensities were generally high throughout the acres covered by the two major event areas described above, although portions of these areas include a mosaic of moderate and a few low intensity areas. Although nearly all above-ground green vegetation was consumed in the high intensity areas, the fire moved through these areas at a fairly rapid rate and did not appear to create elevated temperatures on the soil surface for extended lengths of time. Surface fuels in the 1000 hr class were charred but were generally not consumed and are present in reasonable amounts throughout the fire while most of the small branches in the 10 hour fuels class within the tree crowns remain. Areas around the perimeter of the primary run path that were back burned from roads are primarily low intensity.

Burn Severity

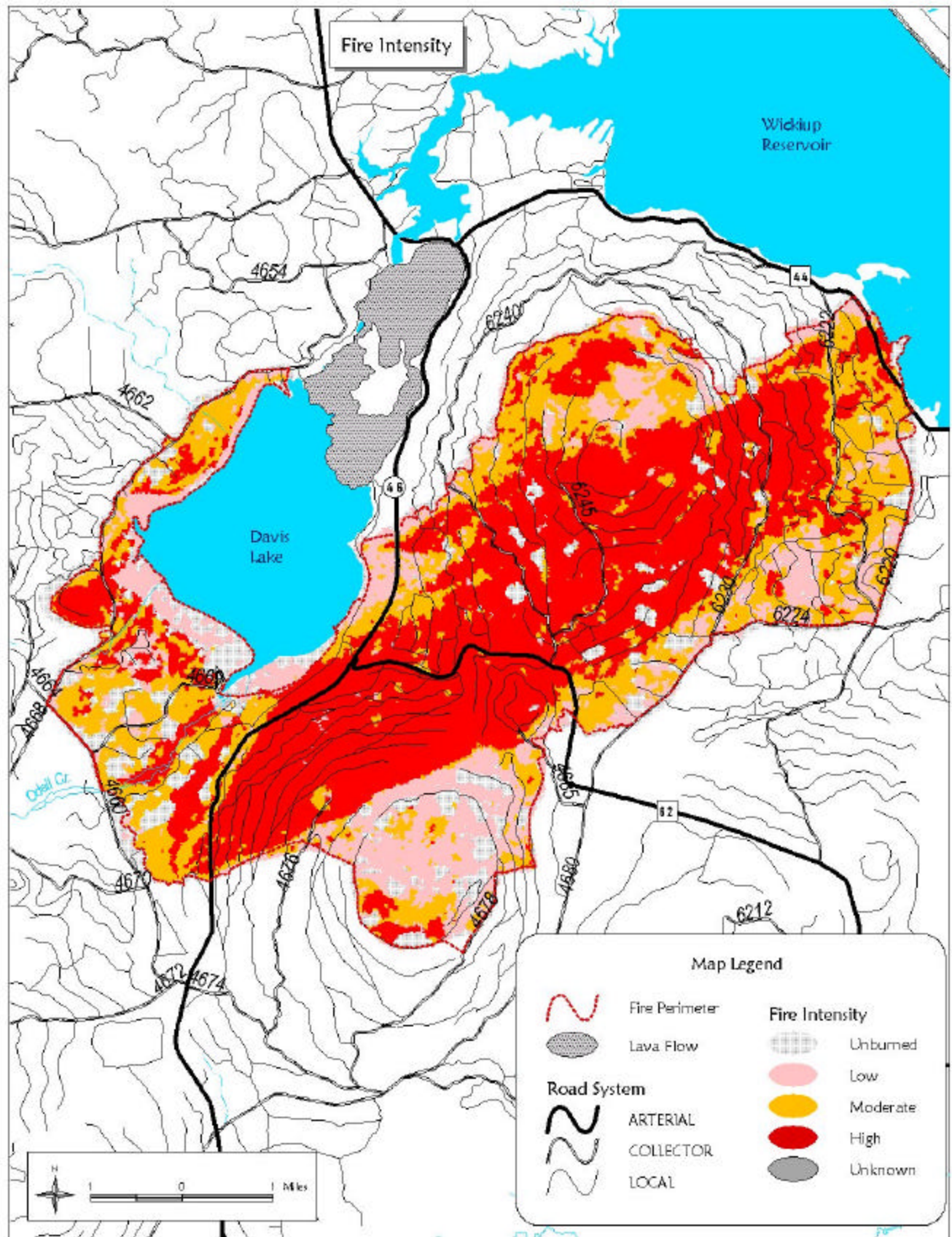
Burn intensities were converted to burn severities using field observations of soil characteristics and slope. Soil characteristics observed in the field generally supported low and moderate severity ratings throughout the fire, including the high intensity areas within the two primary runs. Approximately 20,752 acres were classified as low severity and 508 acres classified as moderate severity based on the following post-fire conditions.

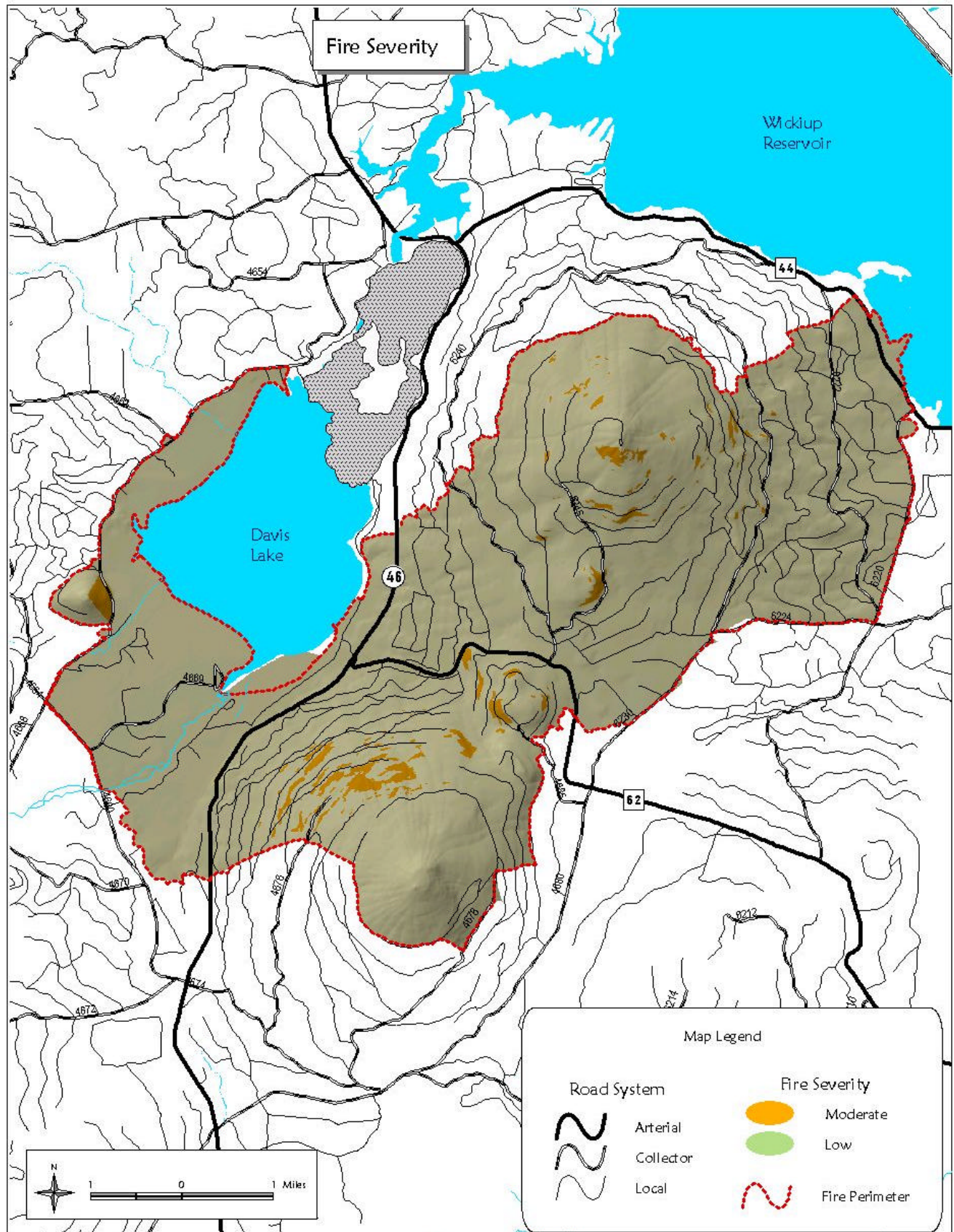
The soil surface throughout these areas is a mosaic of white ash observed at variable depths ranging from 1 to 5 cm, slightly charred and/or consumed litter comprised of needles and bark from burned trees less than 1 cm in depth, and darker ash from the partial consumption of surface litter and duff less than 1 cm in depth. Unmodified mineral soil could be found within 1 to 2 cm underneath all of these surface covers indicating minimal heat pulses down into the soil profile. Fine roots associated with the skeletons of shrubs could also be found intact within 1-2 cm of the surface. Exposed mineral soil is estimated to range from 10 to 30% of the area.

Measurements of infiltration on the surface within the high intensity areas were quite variable but not indicative of elevated hydrophobic conditions. Infiltration through the accumulated white ash is very rapid, while infiltration through exposed mineral soil, darker ash and partially modified litter was comparable to unburned mineral soil outside the fire perimeter. The unburned pumiceous ash present in the area was observed to have a natural repellency of five or more seconds under moisture conditions below field capacity until a wetting front is created. Beaded water was observed for similar amounts of time within the fire perimeter.

Slopes throughout the fire perimeter are gentle to moderate and range from 0 to 35%. All slopes exceeding 15% within acres of high intensity burn were mapped as moderate severity ratings and

comprise approximately 1,342 acres. Slopes exceeding 25% are found on Ranger Butte, Saddle Butte and a small unnamed butte adjacent to a portion of road 6245 and only comprise 56 acres.





Recommendations

- Plant the riparian corridor of Odell and Ranger Creeks with aspen, willow, cottonwood and alder. Nearly three miles of perennial stream channel were burned over by the Davis Fire. Following a field review of the affected area, it is my recommendation that the riparian corridor along the lower two miles of Odell Creek (FS road 4660 to Davis Lake) and the entire length of Ranger Creek (1.0 mile) be re-planted with aspen, willow, cottonwood and alder. The total area to be planted is approximately 35 acres.
- Use hazard trees from East and West Davis campgrounds for instream woody debris structures. Through the use of hazard trees removed from areas such as East and West Davis Campgrounds, instream logjams and complexes could be constructed. These structures would significantly improve riparian area recovery success. Log complexes will aggrade the stream channel, thus elevating the water table and restoring to the floodplain the marshy conditions that had been lost. Log complexes will also increase channel complexity, create habitat and cover, provide areas of refuge and reduce peak flow velocities and energies.
- Decommission Forest Service road 4660-600. This road parallels lower Odell Creek and connects Forest Service roads 4660 and 46-855 at East Davis Campground. This dirt road has several areas that branch off and lead to dispersed campsites along Odell Creek. Riparian vegetation and stream bank stability are compromised as a result. Recommend decommissioning this road along with the rehabilitation of dispersed campsites.
- Salvage of dead standing and down wood should be completed within a 5 year period to prevent the accumulation of ground fuels that would facilitate a catastrophic re-burn of the area and damage soils further. A catastrophic fire of heavy ground fuels could remove more of the duff layer and sterilize soils.
- General Salvage Recommendation
 - Leave woody material on the ground. Amounts of woody material will be determined in the Environmental Documentation (ED) for salvage.
 - Full suspension is recommended on slopes greater than 25 percent.
 - Skidding over snow is recommended on slopes less than 25 percent. Depth of snow will be determined in the ED for salvage.
 - Specific unit prescriptions will be outlined in the Soil and Water Report for the ED.

WILDLIFE

The Davis Fire burned through a wide variety of habitats providing for American bald eagle, elk, deer, black backed woodpeckers, northern spotted owl, American Marten, great gray owls, osprey, flammulated owl and a wide variety of migratory birds. Land Management allocations for the area are shown on pages 1 and 2.

Pre-Fire Conditions

THREATENED SPECIES HABITAT

Northern Spotted Owl

Approximately 11,720 acres of the 48,890-acre Davis LSR are within the Davis Fire perimeter including CHU OR-07. Of the thirteen spotted owl territories on the Crescent Ranger District, five are all or partially within the perimeter. These include all of the Davis Mountain (2006) owl territory, approximately 3/4 of Saddle Butte (2008) and minor portions of Hamner (2002), McCool Butte (2001) and Maklaks Mountain (2004) owl territories. Davis Mountain territory had a nesting pair with young, and a single male was found at each site at Hamner and Maklaks. McCool Butte and Saddle Butte had received two surveys prior to the fire, with no results. A third survey was planned for July to confirm the site was not active.

Annual Status for Northern Spotted Owl Territories within the Davis Fire Area

Forest Site Name (Owl Pair Number)	Current NRF w/in 1.2 mi.	Current NRF w/in 0.7 mi.	Status 93	Status 94	Status 95	Status 96	Status 97	Status 98	Status 99	Status 2000	Status 2001	Status 2002	Status 2003
McCool Bt. (2001)	640	220	unk	unk	NA	Na	NA	NA	unk	NA	unk	unk	N/A
Hamner Bt. (2002)	1291	603	R/2	unk	P	P	P	NA	NA	NA	P	NA	S
Maklaks Mt. (2004)	643	268	unk	unk	R/1	R/1	P-1	P-1	unk	NA	unk	R/2	S
Davis Mt. (2006)	1,692	639	NA	R/2	R/1	R/2	P	R/1	P	R/1	S	P	R/1
Saddle Bt. (2008)	1001	368	P-1	R/1	P-1	R/1	NA	R/2	unk	unk	unk	NA	N/A

OS = single site, single bird

NA = surveyed; not active

R/# = pair, nesting attempt/# of young

P-1 = pair site occupied, 1 bird located

P = pair site, occupied

unk = unknown site status

There were approximately 5,668 acres of NRF in the fire area. The breakdown includes approximately 4,321 acres of NRF within the LSR/CHU, 1,259 acres in matrix and 88 acres in administratively withdrawn. Dispersal habitat was available through out the area.

The Davis LSR Assessment determined the immediate need in the LSR was to reduce the risk of catastrophic loss in portions of the existing late and old-structure stands that were imminently susceptible to insect attack or wildfire. Recommendations for reducing that risk were included in the assessment. Two management projects, Seven Buttes and Seven Buttes Return were phasing in treatments that would reduce habitat in the short term, but decrease the risk to the large tree component. The strategy was to have stands developing into habitat when the current stands the owls were using were no longer habitat due to insect, disease or fire.

American Bald Eagle

Approximately 2,440 acres of Davis Lake BEMA and 1,080 acres South Wickiup BEMA are within the fire perimeter. The nest territories include Round Swamp, Wickiup Reservoir South, Davis Lake Southeast, Davis Lake Northwest, Davis West, and Lava Flow. All but Wickiup South were occupied, with young prior to the fire. All nest trees used were live ponderosa pines.

Territory Name	Year Located	Status 95	Status 96	Status 97	Status 98	Status 99	Status 00	Status 01	Status 02
Davis Lake NW	1973	1	oF	2	F	oF	F	1	1
Davis West	1985	al	RT	RT	al	al	al	al	1
Wickiup Res. S.	1978	oF	F	1	2	oF	oF	oF	oF
Round Swamp	1971	oF	oF	oF	1	2	oF	F	2
Lava Flow	1993	oF	1	F	1	1	1	2	2
Davis Lake SE	1971	1	F	oF	oF	F	2	2	oF

= Number of young fledged RT = Nest used by Redtail Hawk
 /c = Nest used or locations uncertain; need to determine territories
 /d = Downy
 F = Failure; nest with evidence of eggs, but no fledged young
 (active or nesting failure)

oF = Site occupied, at least one adult and a nest observed during breeding season; no evidence of eggs or young (occupied or breeding failure)

Approximately, 1,230 acres of the 2,440-acre total would be described as high quality roosting habitat having 2 or 3 canopy layers with an overstory component of late-successional ponderosa pine, Douglas-fir, sugar pine or some combination. The understory in these stands was comprised of the same species but also included white fir and lodgepole pine. The highest quality roosting habitat is present along Wickiup Reservoir, and east Davis Lake. The lack of multi-canopied late-successional forested habitat along west Davis Lake reduced the quality of roosting habitat there.

The remaining acres (1,210) in the BEMAs were comprised of younger aged stands without an old growth component, plantations, and recently thinned mid- and late-successional stands that did not provide sufficient canopy closure and stand density to moderate the effects of winter storms.

FEDERAL CANDIDATE SPECIES HABITAT

Oregon Spotted Frog

There are three sights within the fire perimeter where Oregon Spotted frogs were found in the mid 1990s: two sites on Odell creek and one at Davis Lake at the mouth of Ranger Creek. Oregon spotted frogs are warm water/marsh specialists tied to permanent water in marsh type habitats with floating vegetation and good hiding areas. Habitat was limited in both Ranger Creek and Odell Creek because of the presence of brook trout, cold stream temperatures, and limited warm, shallow water habitat. More recent surveys have not been conducted in the Odell or Ranger Creek areas. The amount of habitat consisted of several acres of specialized niche habitats that met the frog's needs.

REGIONAL FORESTER SENSITIVE SPECIES, MANAGEMENT INDICATOR SPECIES (MIS) AND SURVEY AND NORTHWEST FOREST PLAN (NWFP) SURVEY AND MANAGE SPECIES

Lake and Riparian Species

Davis Lake, Odell and Ranger Creeks provided habitat for a number of water/riparian dependent species, or species that rely heavily on a combination of habitats that include riparian. These species

would utilize the marsh, sedges, grassy, or wetted areas along the margins of the lake and creeks for foraging such as heron, hawks, bats, and nesting such as the waterfowl or tricolored black bird, or for its entire life cycle such as the tightcoil.

The presence of some of these species also depends on the availability of up-land habitat such as large trees, or snags. This habitat existed in varying degrees around the lake.

Old Growth Species

Late and old tree structure existed across the fire area. Mixed conifer, multi-layer structure was most common with 11,000 acres, followed by 2,300 acres of lodgepole pine, and minor amounts of late and old ponderosa pine approximately 1,500 acres. Species depended not only on the large structure, but also on the abundance of down wood and complex structure available in these stands.

There was very little open ponderosa pine habitat for species such as the white-headed woodpecker or flammulated owl. District management projects Seven Buttes and Seven Buttes Return looked at creating more open single story ponderosa pine stands by thinning from below. A number of the Seven Buttes sales were implemented in the area. There were no Seven Buttes Return sales implemented in the fire area.

Dead Wood Habitat

Species that can take advantage of various habitats, but key in on standing or down dead trees had a mixed bag to choose from. Generally stands that were mid- to late-seral lodgepole pine and mixed conifer plant association groups would meet the needs of the woodpeckers, nuthatches or secondary cavity users. The treated stands were generally deficient in down wood and snags. Approximately 2,300 acres of late to mid-age lodgepole pine and mixed conifer occurred across the fire area.

Diverse Habitats

Carnivores

Carnivores utilize a mixture of habitats. Generally in this area they would favor the mountain hemlock, mixed conifer and lodgepole pine with a fairly closed canopy, and relatively abundant dead wood component. Wolverines, with extremely large home ranges, cover a vast array of habitat types, scavenging food and hunting a wide variety of prey species. They seem to tolerate more openings than the marten or fisher. They typically stick to higher elevations in the spring where they utilize snow covered cirque basins, or avalanche debris for denning. Marten use various stages of mixed conifer and lodgepole pine forests, generally denning in old growth snags, rootwads or jackstraw lodgepole pine. Fisher, who also utilize mixed conifer forest with complex structure of multi canopy, abundant down wood and snags, are rarely found on the district. Sightings of all three species have been documented in the fire area.

Suitable habitat within the fire perimeter included approximately 450 acres of mountain hemlock, 11,000 acres of mixed conifer and 2,300 acres of lodgepole pine.

Ungulates

Deer and Elk were common in the fire area. The Davis Lake Key Elk area is 2,083 acres and located south of Davis Lake. Forested areas along and adjacent to Davis Lake and Odell creek served as calving and fawning areas. Forage was heavily utilized in this area. Forage and cover was available throughout the fire area. There were approximately 15,500 acres of cover, and 5,500 acres of forage.

Post-Fire Conditions

THREATENED SPECIES HABITAT

Northern Spotted Owl

All but 40 acres of NRF was burned. Approximately 5,090 acres of Moderate and high intensity removed all habitat components except leaving scattered large Douglas-fir and ponderosa pine in the moderate intensity burns. Low intensity area of 537 acres may have left multiple layers. It is unknown at this time if it is sufficient for habitat. At this time all areas burned regardless of intensity is considered as lost habitat. Ground confirmation is needed for a more accurate appraisal of habitat. (see page 24 for the Davis LSR and affected nesting, roosting, and foraging habitat).



Owl Nest Tree June 2003



Owl Nest Tree After Fire

Remaining Habitat by Allocation

Land Allocation	Acres of NRF
LSR	20
CHU only*	(16)
Matrix	14
AWD	6

American Bald Eagle

The nest at Davis Lake NW was sucked out of the tree during the enormous winds caused by the fire. The tree still stands, but is now dead due to the heat. Two week prior to the fire this nest was monitored and it had 2 young. The stand received a moderate intensity burn. There was no sign of young or adults. A freshly molted tail feather was found July 21, potentially indicating an adult is still in the area.

The Davis West nest tree was burning at the time it was monitored July 3. Fire crews on site worked under the tree and around it for an hour to put the fire and surrounding hot spots out. There was still a nestling in the nest, and an adult feeding it. The nestling was monitored weekly and determined to be successfully fledged prior to July 21.

The Round Swamp nest stand received a low intensity burn. A snag had fallen into the nest and burned. The nest tree still stands. The nest was monitored July 4th. There was no sign of Eagles at the site. There were several adults and juveniles near Wickiup dam less than a mile from the site. It is unknown if they were the family that belonged to this territory.

The Lava Flow nest stand was unburned and successfully fledged one nestling.

The Davis Lake SE nest stand received a moderate intensity burn. The nest tree was burned $\frac{3}{4}$ of the way up the bole of the tree. July 14 a juvenile was seen nest to the nest, an adult flew in with a fish, and another juvenile was seen flying into an adjacent burnt tree. By July 21 the second juvenile had fledged.

Approximately, 1,800 acres of BEMA had received high intensity, 1,100 moderate, and 400 low; leaving 100 acres of the BEMAs untouched. Nesting structure would remain on 500 – 1,600 acres. Canopy layers needed for roosting habitat maybe available on 100-400 acres.

FEDERAL CANDIDATE SPECIES HABITAT

Oregon Spotted Frog

The opening of the canopy may benefit the Oregon spotted frog. Increasing temperatures in the shallows favor the frogs over the fish. Sedimentation would not adversely affect the frogs as they lay eggs attached to vegetation, and winter buried in the sediment.

REGIONAL FORESTER SENSITIVE SPECIES, MANAGEMENT INDICATOR SPECIES (MIS) AND SURVEY AND NORTHWEST FOREST PLAN (NWFP) SURVEY AND MANAGE SPECIES

Lake and Riparian Species

The fire did not eliminate any components critical to the species dependent on the Lake or riparian area. Davis Lake, and Ranger Creeks did not have much change and will continue to provide for the species that relied on it. Odell creek has the potential to become a more hardwood dominated riparian area providing for a greater diversity of songbirds and woodpeckers.

Old Growth Species

Late and old tree structure and complexity of structure remains on 848 acres; single story late and old structure remains or was created on approximately 100 acres. Snags and down wood exist to a limited extent in the high intensity area and more in the moderate. Low intensity burns generally went to a Old forest single story more open structure. There were stands that did retain a multi layer structure in the low intensity burns. It is not possible to tease that out of the data to date and field surveys of the area is needed for an accurate assessment of the structure left.

Old growth lodgepole pine took the greatest hit with the greatest intensity. Lodgepole pine does not tolerate underburning. Approximately 75 acres remain unburned, 300 acres were underburned. There may be additional habitat loss in the low intensity burned areas.

Dead Wood Habitat

While there were acres of snags and down wood lost in the fire, a lot of dead trees were created. In the short term there will be an abundance of snags. Fire hardened snags and down wood, while they last longer on the landscape, are used differently depending on the intensity of fire that killed them. There is less substrate for insects, less nesting structure for those woodpeckers that seek tree rot to excavate in. Less is known on the decay patterns in fire hardened snags.

Diverse Habitats

Carnivores

Lose of canopy, and abundance of down wood will greatly affect the prey of the marten and fisher. Habitat that remains includes 370 acres of the mountain hemlock, 1,800 acres of mixed conifer and 2,300 acres of the lodgepole pine.

Ungulates

Seventy-four percent of the Davis Lake Key Elk Area was burned, 33% of it severely. There remains 584 acres of unburned cover across the burn area, mostly around the perimeter. There is less secure cover in traditional fawning/calving areas. The animals will be more vulnerable in the open. While 80% of the forage was burned, grasses are currently coming back. Brush species will take longer to recover and cover will take even longer. The area will support fewer animals in the short term.

Federally listed, Candidate, Regional Forester Sensitive, Management Indicator Species and Northwest Forest Plan Survey and Manage Species of the Deschutes National Forest

Species	Status	Habitat	Presence
Canada Lynx	Federal Threatened	Subalpine fir w/ Lodgepole	No habitat
Northern Bald Eagle	Federal Threatened, MIS	Lakeside, Large trees	Documented
Northern Spotted Owl	Federal Threatened, MIS	Old Growth Mixed Conifer	Documented
Oregon Spotted Frog	Federal Candidate	Riparian, Marsh	Documented
Bufflehead Duck	Regional Forester Sensitive	Lake, snags	Documented
Harlequin Duck	Regional Forester Sensitive	Rapid Streams, Large trees	No habitat
Horned Grebe	Regional Forester Sensitive	Lake	Unknown
Pacific Fisher	Regional Forester Sensitive	Mixed, Complex	Documented
Pygmy Rabbit	Regional Forester Sensitive	Sagebrush flats	No habitat
Red-necked Grebe	Regional Forester Sensitive	Lake	Unknown
Tricolored Blackbird	Regional Forester Sensitive	Lakeside, Bulrush	Unknown
Western Sage Grouse	Regional Forester Sensitive	Sagebrush flats	No habitat
Yellow Rail	Regional Forester Sensitive	Marsh	No habitat
California Wolverine	Regional Forester Sensitive, MIS	Mix, High elevation	Documented
Peregrine Falcon	Regional Forester Sensitive, MIS	Riparian, Cliffs	Documented
Flammulated Owl	NWFP Survey & Manage	Old Growth Ponderosa Pine	Documented
Fringed Myotis	NWFP Survey & Manage	Riparian, Caves, OG tree bark, snags	Unknown
Long-eared Myotis	NWFP Survey & Manage	Riparian, Caves, OG tree bark, snags	Unknown
Long-legged Myotis	NWFP Survey & Manage	Riparian, Caves, OG tree bark, snags	Unknown
Pallid Bats	NWFP Survey & Manage	Riparian, Caves, OG tree bark, snags	Unknown

Species	Status	Habitat	Presence
Pygmy Nuthatch	NWFP Survey & Manage	Mix, snags and down wood	Documented
Silver-haired Myotis	NWFP Survey & Manage	Riparian, Caves, OG tree bark, snags	Unknown
White-Headed Woodpecker	NWFP Survey & Manage	Old Growth Ponderosa Pine	Documented
Crater Lake Tightcoil (mollusk)	NWFP Survey & Manage	Riparian	Not found
Black-back Woodpecker	NWFP Survey & Manage, MIS	Lodgepole Pine	Documented
Great Gray Owl	NWFP Survey & Manage, MIS	Riparian, Large trees	Documented
American Marten	MIS	Mixed, Complex	Documented
Cooper's Hawk	MIS	Riparian	Documented
Elk	MIS	Mix	Documented
Golden Eagle	MIS	Open, Large Trees	Documented
Great Blue Heron	MIS	Riparian	Documented
Mule Deer	MIS	Mix	Documented
Northern Goshawk	MIS	Ponderosa Pine	Documented
Osprey	MIS	Lakeside, Large trees	Documented
Redtail Hawk	MIS	Mix, Large Trees	Documented
Sharpshin Hawk	MIS	Riparian	Documented
Townsend's Big-eared Bat	MIS	Riparian, Caves	Unknown
Waterfowl	MIS	Riparian, Lakeside	Documented
Woodpecker Guild*	MIS	Snags and Down wood	Documented

* The woodpecker guild includes the pileated woodpecker, Williamson's sapsucker, Lewis' woodpecker, Common flicker, white-headed woodpecker, hairy woodpecker, northern three-toed woodpecker, and black-backed woodpecker.

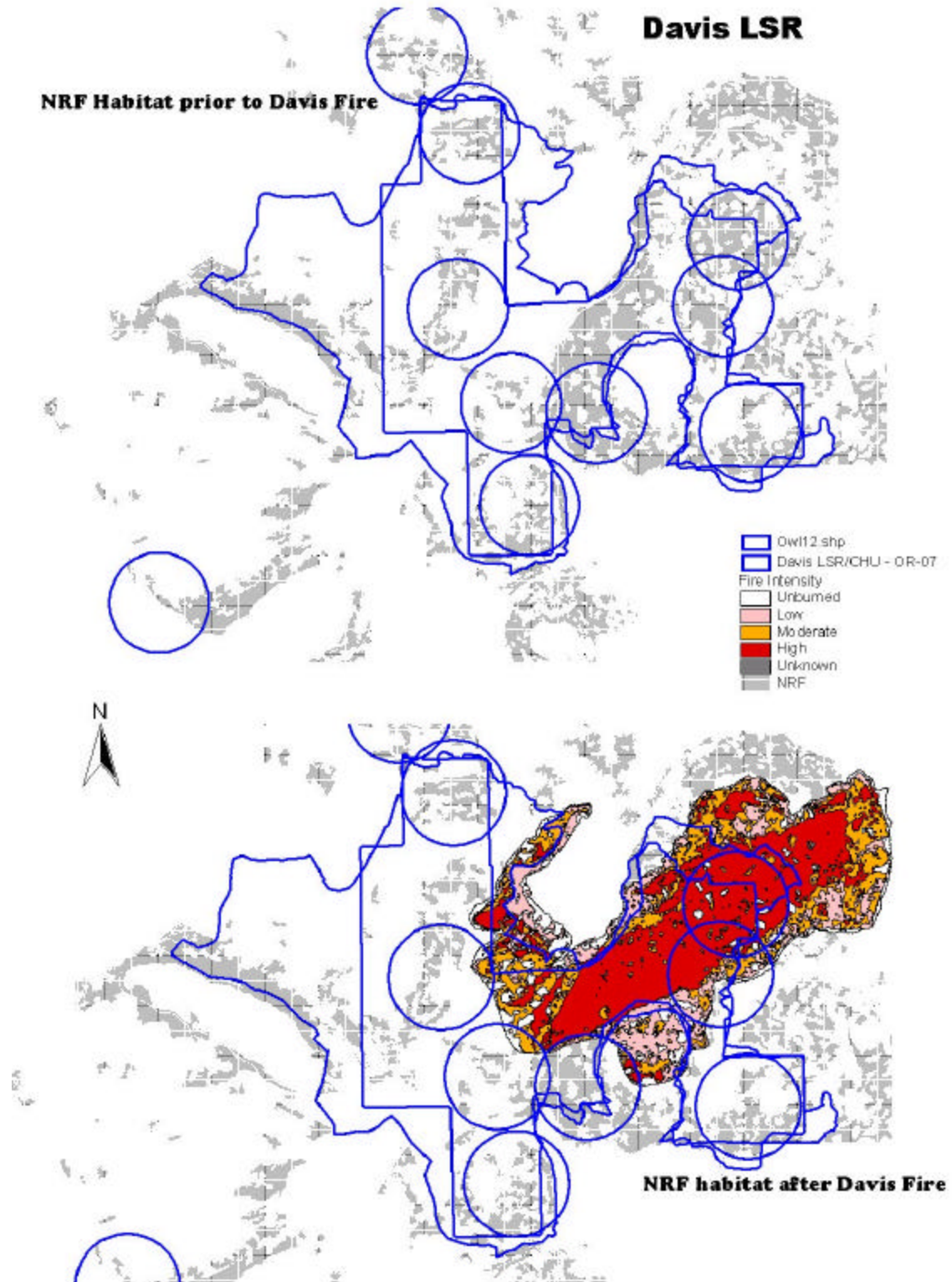
Recommendations

- Restore hiding cover in burned over plantations by planting appropriate species.
- Plant hardwoods in Odell creek to provide a more diverse habitat.
-
- The Davis LSRA recommends in the case of catastrophic loss of habitat to “treat to enhance and obtain LOS habitat characteristics”
 - Plant appropriate species across large portions of the LSR to speed recovery
 - Leave a subset of acres to recover “naturally” to provide for differing habitats
 - Leave sufficient large snags and down wood as described in the LSRA, plus additional snags as needed for future down wood. Snags should be a combination of fire killed case hardened and fire killed noncase hardened.
- Decommission the 1 mile of the 4600855, and reconstruct junction for access into East Davis Campground.
- Decommission the 4660600 to reduce access and disturbance of Big Game.
- Maintain the current area closure until next spring to reduce the stress on big game, and surviving wildlife.
- Develop an area closure to off road vehicles within the fire perimeter, to reduce harassment of wildlife while the area is recovering 5-10 years.

- Develop a permanent area closure to off road vehicles within the Davis Lake Key Elk area.
- Delay the construction, or route the Metolius/Windigo trail outside the West Davis BEMA until eagles have reestablished themselves in the area.
- Complete an analysis of the burned area to determine: how the various treatments from Seven Buttes affected fire behavior; the benefits and drawbacks by treatments; and provide recommendations for future treatments in the LSR.

Monitoring

- In the spring of 2004, survey remaining NRF on Davis to determine if spotted owl pair moved to NW side of the mountain.
- Continue to monitor other historical spotted owl nest sites.
- Survey historic Oregon spotted frog sites in the spring 2004 to determine new baseline.
- Monitor Eagle nest sites in the spring to determine if Eagles use existing territories, shift or move out.
- Monitor recovery of forage species across the fire area and especially in Key elk area. Reassess after spring of 2004 to determine if planting is necessary.
- Monitor snag fall down rate, if possible study differing uses by degree of burn and case hardening.



VEGETATION

Pre-Fire Conditions

Timber Resource and Forest Health

The objectives of this assessment are to identify and evaluate fire related impacts to the timber resource both in and outside of the suitable timber base, to identify direct/indirect effects on forest health, and to address the needed treatments to ensure restoration of a forested landscape over time. In addition, this assessment aims to evaluate and plan for meeting long term Late Successional Reserve vegetative conditions.

Several timber sales have been planned and/or implemented in the fire area in the past few years. These are from the Seven Buttes EA and the Seven Buttes Return EA. The individual sales will be discussed later in this document. The higher elevations on the buttes, where the mountain hemlock is, are considered unsuitable for timber production.

The issues and concerns within the Davis Fire area are tree mortality and regeneration of appropriate tree species to effectively meet long-term vegetative goals for a variety of ecosystems across the landscape.

Species Composition

The majority of the burn area is forested with dry mixed conifer stands comprised of ponderosa pine overstories with Douglas-fir in many areas. Sugar pine, western white pine, and white fir/Shasta fir were present in the overstory in some portions of the fire area. Approximately 10% percent of the area was forested in ponderosa pine, and 15% percent of the area was in lodgepole pine.

Understories consisted of white fir, lodgepole pine, and some of the other species in the mixed conifer areas, lodgepole pine and ponderosa pine in the ponderosa stands, and lodgepole pine with occasional other species in the lodgepole pine stands.

The higher elevations of the buttes consist primarily of mountain hemlock, with lodgepole pine and western white pine very common, especially in openings and Phellinus root rot pockets. Shasta fir is common in the transition areas from mixed conifer to the hemlock stands.

Overstories are dominated by 250-400 year old trees of the fire resistant species, ponderosa pine and Douglas-fir. Areas of similar aged sugar pine and Shasta fir are scattered around the fire area as well.

Lodgepole pine overstories rarely exceed 125 years of age in the fire area.

Midstories consisted of trees predominantly less than 125 years old that have come in since the active suppression of fire in the area.

Approximately 5,000 acres (24%) of the area is in conifer regeneration areas of both natural and planted stock and will be referred to in this document as plantations. Most of these areas are 30 years old, or less. Species planted generally reflect the early seral species of the stand they are replacing.

Stocking Levels

Areas not already thinned with timber sale activity had high to very high stocking levels. Thinned areas were stocked to just below recommended maximum stocking levels. Plantations were in the process of being thinned to within recommended stocking levels, usually close to the upper stocking level curves.

Some stands that were treated or scheduled to treat were being managed towards open, park-like stands. The majority of the stands, though, were being managed towards multi-storied stand structures. Untreated stands were highly multi-storied, with overtopped and interlocking crowns the norm.

Special Forest Products

The Davis Fire area provides several types of special forest products, including commercial firewood, personal use firewood, and mushroom gathering. Some commercial uses are not allowed within the Davis LSR.

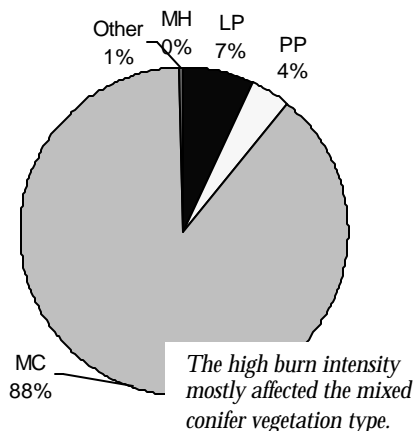
Post-Fire Conditions

Vegetation Effects

All high and most moderate burn intensity areas will result in stand replacement event. These are 48 and 26 percent of the fire area, respectively. A few areas in the interior and quite a bit along the edges of the fire were more like a very intense under burn, with fairly high scorch heights, often scorching entire trees. Actual mortality on some of the more severely scorched trees will not be known for sure until next growing season, but generally, pines with less than about 30% of the crown not scorched will die within the first couple of years after a fire. This mortality is usually due to insufficient crown mass to support the basic biological functions of the trees, including maintaining defenses against insects and disease. This mortality could affect trees with greater live crown mass if droughty conditions continue. (see burn intensity map, page 13)

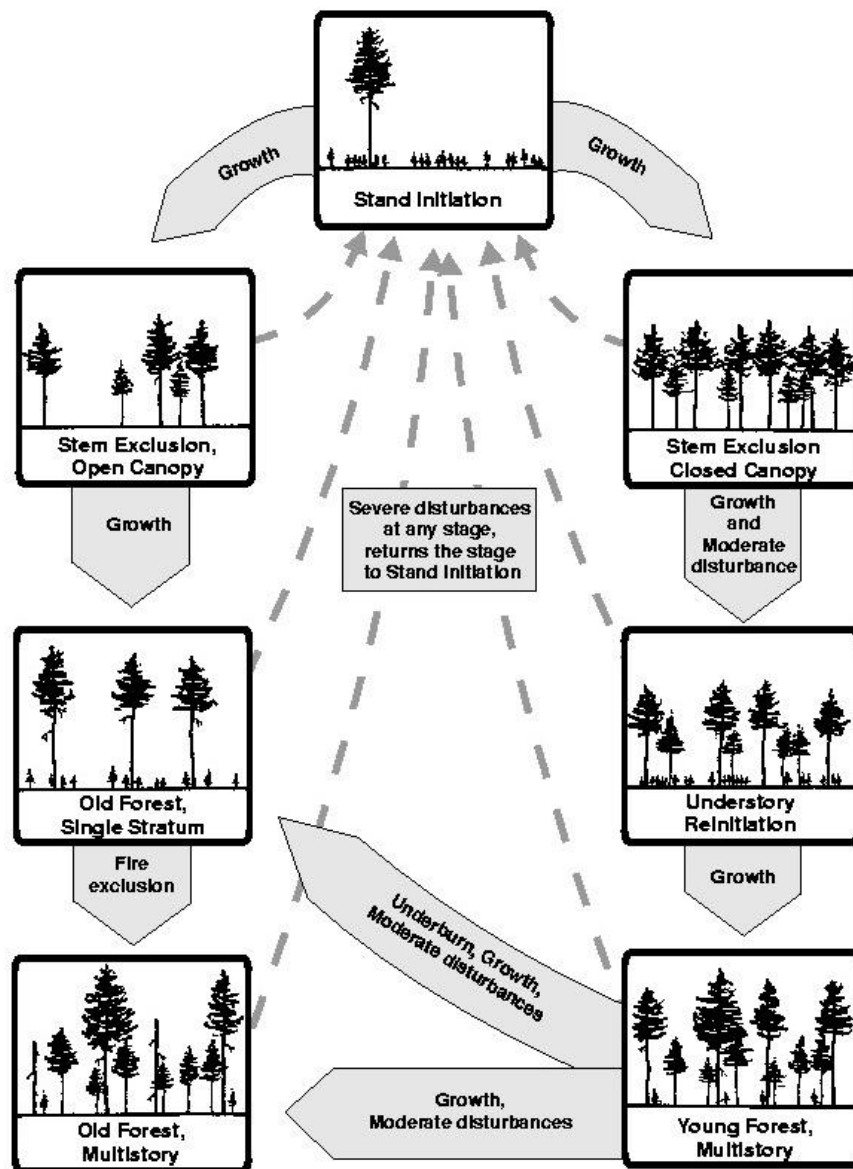
Acres by Vegetation Type and Burn Intensity

Vegetation Type	High Intensity	Moderate Intensity	Low Intensity	Unburned
Lodgepole Pine	693	1522	503	602
Ponderosa Pine	407	1034	496	101
Mixed Conifer	8867	2900	2019	750
Mountain Hemlock	4	73	359	51
Grass/Brush	65	37	370	213



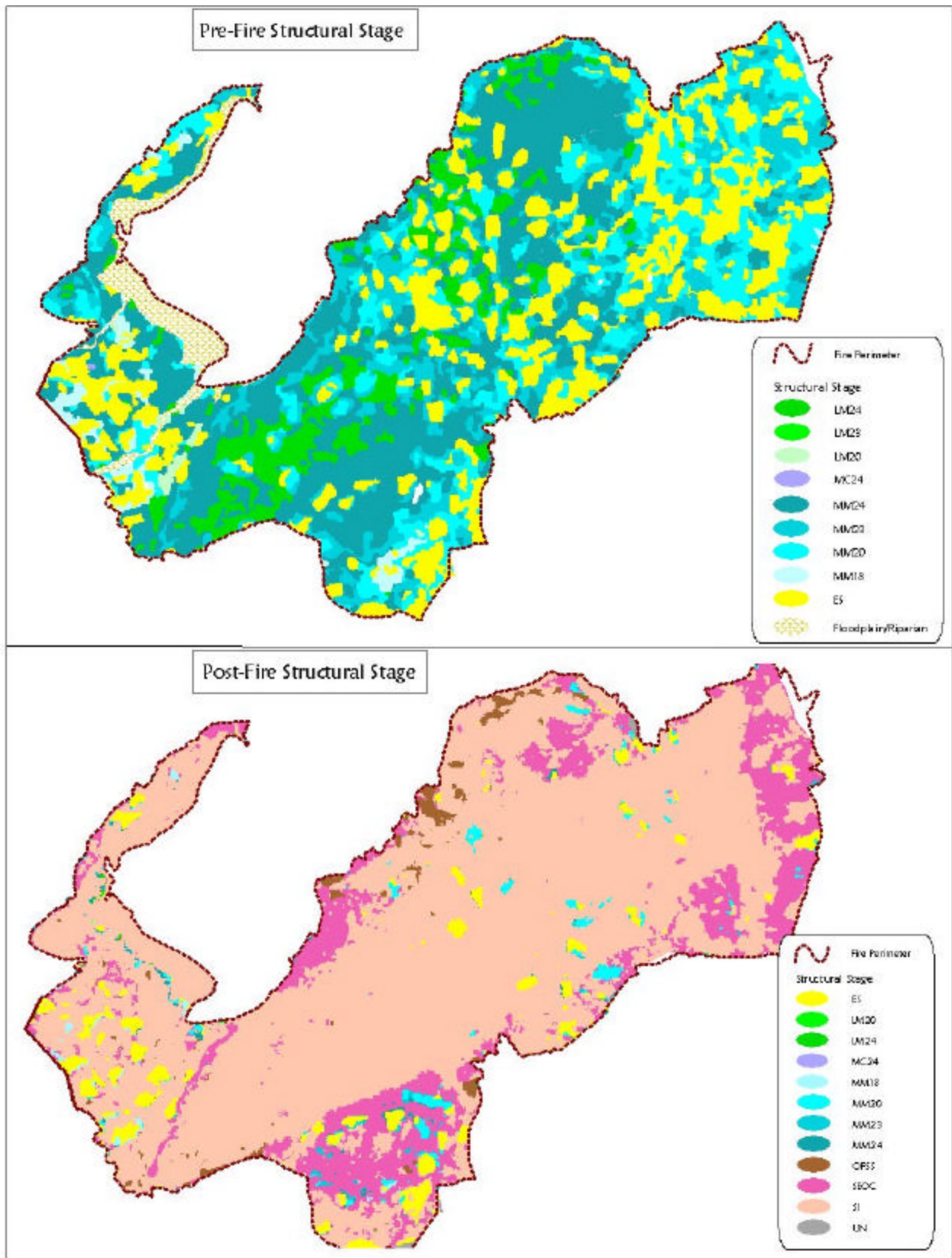
Analysis of post-fire satellite imagery reveals the vegetative effects shown in Table 1, above. Most of the highest impact to vegetation occurred in the mixed conifer, synonymous with the acres burned. The high intensity areas were the black vegetation areas, the moderate intensity areas were brown vegetation areas, and the low intensity has relatively green vegetation. High intensity burn areas are considered 100% mortality and revert to stand initiation stage. Within moderate intensity burn areas, the same is considered true except for the ponderosa pine vegetation type where there are large trees in the overstory. Future ground truthing of the fire intensity and mortality will allow us to refine these estimates.

Low burn intensity areas experienced relatively low tree mortality with 0-20 % mortality in the pines and Douglas-fir, and higher mortalities for the other species. There may be a slight increase of growth in tree species, grasses and forbs due to the release of nutrients from the burned litter and duff.



Forest successional stages, from The Interior Columbia Basin Ecosystem Management Project, DEIS.

The map on the following page displays pre-fire and post-fire structural stages. Post-fire structural stages were determined using this diagram. The stages resulting from the Davis Fire are SEOC – Stem Exclusion Closed Canopy; SI – Stand Initiation, and OFSS – Old Forest Single Stratum.



Tree Mortality and Volumes

Based on stand examination information prior to the fire, volumes per acre ranged from about 4 mbf in the lodgepole pine to 20 mbf in the mixed conifer stands. The table below shows estimated volume per acre loss by general plant association areas. High intensity burn is considered 100% mortality, and moderate intensity burn is considered 80% mortality.

Estimated Volume Loss on the Davis Fire (MBF) in Areas of Stand Replacement Intensities

Vegetation Type	Estimated MBF /Acre	Estimated Acres In High Intensities (100% mortality)	Estimated Acres In Mod. Intensities (80% mortality)	Total Estimated Loss (MBF)*
Lodgepole pine	4	693	1522	6382
Ponderosa pine	20	407	1034	20032
Mixed conifer	20	8867	2900	48748
Mountain Hemlock	10	4	73	1123
Grass/Brush	0	0	0	0
Total				76285 mbf 76 mmbf

**This Figure assumes no volume in early seral stands. For example, the 1,522 acres of lodgepole in moderate intensity was reduced by 325 acres of early seral to compute the volume.*

Vegetation Recovery

As noted above, conifer species are limited in their ability to survive a fire. Some of the roots, the cambium of the main trunk, the buds, and the live crown must survive for the tree to keep living. The best predictor of survival for the pines is the amount of live foliage on the trees. In general, if at least 1/3 of the foliage is still green (unscorched), and if the cambium is still alive, the tree should survive if drought and/or insects don't intervene. The true fir, hemlock, and lodgepole pine are much more susceptible to fires due to their thin bark. Douglas-fir susceptibility is comparable to the pines other than lodgepole pine.

Natural regeneration of the conifers after a fire is dependent on seed dispersal from healthy trees. Generally ponderosa pine seed can be expected to fall 40-80 feet from the seed source. In large areas of the fire where the overstory pine was killed regeneration from adjacent pine will not be available. Some pine seed may be still viable in the areas where the duff was not severely burned and could be available to contribute to regeneration establishment.

Fir and Douglas-fir regeneration processes are similar to pine. These seeds are also quite limited in their spread distance, and can not be expected to disperse to interior portions of the fire.

Brush on the fire, particularly the fire responsive species such as ceanothus, will probably respond quite well to the openings created by the fire, since much of the soil and duff had minimal impacts from the fire.

Grass fields on the fire primarily consisted of the shores of Davis Lake. The high moisture content in the soils there have contributed to a rapid green-up of the vegetation burned on the wet areas and shore lines of the Davis Lake area.

Natural regeneration of conifer species near the edges of the fire and near unburned islands will probably be very significant even to the point of extreme overstocking. This can pose a future threat of fire at stand replacement intensities as these dense areas have crown closure and competition-induced mortality.

Recovery of Commercial Timber

Timber volume affected by the fire was calculated using satellite imagery and interpretation to establish the burn intensity within the various stands affected and calculating mortality volume and recoverable volume based on pre-burn forest stand data. Field observations and sale prescriptions were also used to help estimate predicted volumes.

Loss of timber value due to the fire should be identified in the areas under contract and adjustments made according to the terms of the contracts. Inclusion of any additional materials will need to be done only as identified through the normal environmental analysis and decision-making processes. The timber sales affected by this fire that are still under contract are: Bird, Lopped, and Royal.

The fire affected timber, both designated for removal and/or leave, harvest unit boundaries, and individually marked trees. Generally the **trees within the areas of high intensity fire** could be characterized as blackened from top to bottom. These areas had 100 percent mortality. Timber harvest unit boundaries and timber designation markings are non-existent within these areas.

Trees within areas of moderate fire intensity have scorched (brown) foliage and blackened boles of various heights. These areas sustained between 50 and 100 percent mortality. Timber harvest unit boundaries and timber designation marking are randomly impacted and difficult to consistently locate. Designation markings range from visible to only partially visible to non-existent.

Trees within areas of low fire intensity have scorched foliage with green foliage common. Boles have been blackened generally up about 6-8'. Timber designation markings for leave/cut trees and harvest boundaries are mostly intact in these areas. Seedlings and saplings sustained various degrees of damage.

Timber recovery outside of the contracted areas could be done for the following reasons:

- Recovery of timber volume in excess to wildlife and soil stabilization needs would help offset the costs of fuels reduction and regeneration projects in the fire.
- A reduction in the amount of fuels left on the site would benefit the establishing stand at the next entry of fire.
- A reduction in the amount of fuels left on the site would reduce the effects of heavy fuels and the long duration burning and glazing of the soils, making that more of a micro site effect rather than large-scale.

Much of the burned area contains stands with pine overstories with occasional Douglas-fir, and regeneration, saplings, poles, and small saw timber dominated by true fir and lodgepole pine. The saplings and poles are likely to have no economic value in terms of timber recovery. Burned trees are generally not suitable for chip products. Areas of suitable recovery are spread out throughout the burn perimeter and may require additional transportation systems in some small areas.

Timber value as a result of this fire has been reduced. The demand for fire killed timber is less than for green standing timber. Available time for harvesting useable trees is limited if quality timber is to be recovered. Blue stain and insects will generally degrade the wood beyond use in less than one year. Insects of concern are longhorn beetles, red turpentine beetles, mountain pine beetle, and Ips.

Special Forest Products

There will be little immediate interest by commercial firewood purchasers for charred wood because recently burnt wood creates black dust that would enter customer homes. This dust has been described as "poison." In time, as bark falls from trees and weather washes the trees, interest will probably increase. The same is true for personal use firewood. Because of Road and Area Closures that are currently in affect, portions of two designated firewood-cutting areas are closed.

The main impact expected during the matsutake mushroom season for 2003 is administering the Road and Area closures. It is expected that morel mushrooms will be of interest in the fire area during the 2004 spring season. There are three possible scenarios for the mushroom harvesting:

- Road and area closures remain in effect – no mushroom harvest in burn area.
- Road and area closure lifted and mushroom harvest allowed in all burned area except for LSR.
- Road and area closure lifted and mushroom harvest allowed in all burned areas including LSR.

Insects and Diseases

After a wildfire, there is typically a large increase in the populations of certain forest insects. Recently dead wood is colonized by a wide variety of wood boring insects and bark beetles that sometimes come from great distances to take advantage of a new and abundant food source. These insects introduce various fungi into the wood that they infest and the fungi begin the decay process that eventually leads to the recycling of the dead material and the release of nutrients back into the system. Many of the same insects, particularly the bark beetles, will also infest trees that are not yet dead but that have been sufficiently wounded by the fire to have their defense systems impaired. In subsequent years, typically two to four years after the fire, the populations of bark beetles may become quite large and may move beyond the perimeter of the fire and infest trees that did not sustain any damage in the original fire event.

There are three important insect-related issues associated with forest fires:

1. The survival of fire-damaged trees
2. Bark beetle outbreaks in live trees following the buildup of insect populations within the fire perimeter
3. Wood deterioration (and value loss) brought about by insect-vectoring of stain and decay fungi

Each of these three issues is briefly discussed as follows:

The Survival of Fire-damaged Trees

Tree survival after fire differs greatly by tree species, tree age, the time of year of the fire, fire intensity, and numerous other factors. Because the Davis Fire was an early-season fire, the damage inflicted on trees that were still actively growing will be relatively greater than comparable damage occurring late in a late-season (August) fire after growth has ceased for the year.

Survival of ponderosa pine can best be assessed by examining the extent of fire damage to the crown. Trees retaining a live green crown that equals 25% or more of the total tree height have a reasonable chance of surviving the fire. (Some literature puts this survival probability at 50:50). Pines with less than 25% live crown ratio may survive during wet periods, but those trees may be vulnerable during years of “normal” or “below normal” precipitation. Root damage or basal bole damage that has killed the cambium for >40 % of the circumference of the bole would override the crown assessment (leading to a high likelihood of mortality), but in the absence of bole/root damage, the crown assessment should be good for predicting ponderosa pine survival.

Douglas-fir survival is most likely when bole damage is less than 1/3 of the circumference and less than 8 feet up the bole, along with crown scorch that is less than 30% of the live crown. Douglas-firs that have lost 40% of crown and have bole damage around 50% of the circumference are not likely to survive the fire. If Douglas-fir beetles have been active in the area, even trees with light fire damage may be colonized and killed by the bark beetles.

Ground fires that consume the entire duff layer are sufficient to lead to the death of Engelmann spruce if the tree has evidence of bole charring around the entire circumference.

Western larch will survive most fires of light severity, and becomes likely to die from fire damage only when bole scorch exceeds 80% of the total tree height and when crown loss exceeds 90%.

Lodgepole pine is not likely to survive fire damage that results in crown loss of 50% along with bole damage greater than 50% of the circumference, with char evident about two feet above the ground line.

White fir is likely to die from fires where 100% of the duff is consumed, because this usually translates into significant root damage for this thin-barked species. Bole scorch of 30-40% of the circumference of the bole is usually sufficient to cause death in white fir. Crown loss due to fire may be very slight in fir trees that die from root damage.

Subalpine fir is slightly more fire-tolerant than white fir, but is likely to die from bole scorch that exceeds 75% of the circumference of the bole at the ground line.

Shasta red fir has greater tolerance of fire than the other true firs, but the likelihood of survival for this species decreases when basal cambial damage exceeds 25% of the circumference of the bole. Crown scorch can be tolerated as long as the tree retains at least 30% green crown.

Threshold damage levels of bole and crown scorch are not as readily available for other species of conifers including mountain hemlock, sugar pine and western white pine, but as a general rule, if these trees have sustained cambial damage exceeding 50% of the circumference of the cambium, their likelihood of long term survival is fairly low.

Bark beetles are some of the key agents that are responsible for the eventual death of fire-damaged trees. Virtually all conifer species have their own associated bark beetles that are capable of infesting and killing trees under stress. Some of the bark beetles most commonly involved in killing fire-damaged trees include western pine beetle, mountain pine beetle, pine engraver, red turpentine beetle, and Douglas-fir beetle.

Bark Beetle Outbreaks in Live Trees Following the Buildup of Insect Populations within the Fire Perimeter

Although bark beetles can infest any tree damaged by fire, there are three tree species in particular (ponderosa pine, Douglas-fir and Engelmann spruce) where outbreaks can occur in healthy trees several years later. Beginning in the year of the fire (if an early-season event such as Davis Fire) and continuing for two or three years afterwards, fire-damaged trees are infested by the associated bark beetles and eventually the large populations move into adjacent stands. The extent to which this occurs is highly variable, and is dependent on factors such as the size of the bark beetle population before the fire, the size of the fire and extent of available host material, the moisture conditions that prevail before and after the fire, and assorted other variables. The worst documented case for Douglas-fir was one where bark beetles killed the same number of trees after the fire that were lost in the fire itself. Within the area of the Davis Fire, three bark beetle species could be involved in creating these outbreaks (Ponderosa pine: western pine beetle and pine engraver; Douglas-fir: Douglas-fir beetle).

Wood Deterioration (and Value Loss) Brought about by Insect-vectoring of Stain and Decay Fungi

Virtually all of the bark and wood-infesting insects have fungi associated with them, and these fungi are introduced into the wood during the host-colonization process. These associated fungi are ones that produce stains and decays in the wood. It has been recognized that wood infested by woodborers decays considerably faster than uninfested wood. Given their roles as primary decomposers, the wood boring insects are the primary reason for the sense of urgency that accompanies the salvage of fire-killed wood.

There are three important families of wood boring insects that use recently dead wood as their food source. These include the two beetle families *Buprestidae* (flat-headed or metallic wood borers) and *Cerambycidae* (round-headed or longhorned wood borers), and the wasp family *Siricidae* (woodwasps or horntails). Most of these wood-boring insects are fairly large, measuring about one inch in length in their adult stage (beetle or wasp), with larval stages that can be considerably larger. Most of them have a one-year life cycle that begins with the adult stage in the spring, summer or fall. Eggs are laid within the bark (beetles) or within the sapwood (woodwasps) and larvae feed for nearly a year as they

grow from a small egg to a fairly large-sized grub at maturity. Both of the beetle families feed on the cambial tissue between the bark and the wood before they enter the sapwood (the woodwasps do not). The majority of wood borers infest trees that are recently dead, usually *within the first year after death*. Any dead tree is likely to be infested by wood borers, but as a general rule, trees killed by fires will have a much higher proportion of attacks than trees dying of other causes.

Because the Davis Fire occurred early in the summer, there will be substantial flights of many wood borer species this year and colonization of the dead wood will be substantial by the end of 2003. Other insects will colonize the remaining dead trees in the spring and summer of 2004.

The general rule of thumb is that limited wood deterioration (staining) occurs in the first year after a fire and then general deterioration (decay) begins to be noticeable toward the end of the second year. Since the Davis Fire was an early-season fire, there may be blue-staining occurring in the sapwood of dead trees by the fall of 2003. Decay is probably not likely to be noticeable until the fall of 2004 and then, should be superficial and confined to the sapwood.

For reference purposes on the incidence and development of bluestain, the following writeup is excerpted from a study of wood deterioration on the Hash Rock Fire. (It is important to note that the Hash Rock Fire occurred in August 2000 and as such, stain may have developed more slowly than what we might expect for the Davis Fire):

Recommendations

- Site prep areas for planting where no overstory exists (approximately 4,000 acres).
- Re-plant high and moderate intensity areas with desirable species, with particular emphasis on the Davis LSR.
- Timber recovery should be considered throughout the fire area, and should be considered in two distinct circumstances: within the sale areas already under contract with a purchaser, and areas not included in contracted areas.
- Contract modifications should be made to recover value in commercial timber killed within the active timber sales. This would preferably include areas within and between the contracted units, but still within the sale boundaries.
- Recovery of commercial volume should be accomplished in sales outside of the current sale areas.
- Collect seed for ponderosa pine, sugar pine, Douglas-fir, western white pine, and white fir for any of these species that are lacking adequate inventories for reforestation efforts on the fire.
- Monitor establishment of natural regeneration for relevant species and densities.
- Retain green seed source trees within and adjacent to the burned area.
- Reduce potential future fuel loadings by removing the standing and down dead not needed for soil stability and wildlife uses.
- Model fuel loadings through time and compare alternative levels of treatment.
- Model forest establishment through time and seek to optimize return to the LSR objectives of the majority of the fire area.

Evaluation and Monitoring

The following monitoring should occur over the next 1-5 years within the burn area:

- Monitor seed cast and evaluate germination potential of conifer seeds.
- Evaluate regeneration and stocking levels appropriate for optimal recovery to LSR objectives.

- Evaluate regeneration of brush species and their competition potential with conifer regeneration.
- Update the existing vegetation database to reflect changes created by the fire.
- Identify the management approaches and silvicultural methods to meet the management strategy area (MSA) long-term goals.
- The following monitoring should occur over the next 5-10 years within the burn area:
 - Continue to compare pre-burn and post-burn stand conditions to determine future silvicultural treatments that would reduce the potential for large fire occurrence in this and other areas while moving the stand towards meeting the LSR objectives.
 - Evaluate the vegetative conditions on the fire and compare with landscape objectives for the LSR.
 - Ensure adequate regeneration establishment to meet MSA goals.
 - Provide for areas where stocking levels will be maintained at levels that will ensure open-grown, long crowned ponderosa pine and Douglas-fir trees will be present on the site in the next century or two.

BOTANY

Pre-Fire Conditions

The Davis Fire affected several areas of regional ecological significance. The fire burned a significant portion of the Davis LSR, protected by the Northwest Forest Plan as a refuge for late-successional species. Sites for *Tritomaria exsectiformis* (Survey and Manage Category B, manage all known sites, pre-disturbance surveys not practical) are known along Ranger Creek (in Davis LSR MSA M) from the springs and downstream where shade and woody debris in the stream provide suitable habitat.

The fire burned vegetation to the water's edge in many places along Ranger Creek and heat from the fire dessicated mosses and liverworts on woody debris in the stream.

Vegetation in a small area around the spring was relatively unaffected by the fire. *Tritomaria exsectiformis* was found on woody debris in the spring on July 18, 2003.

LSR values and Survey and Manage plant populations could be at risk of noxious weed invasion if existing weed populations spread into burned areas adjacent to and within the LSR.

Noxious Weeds/Invasive species

Recommendations

Objectives: Prevent the spread of noxious and undesirable species from noxious weed reservoirs. Prevent the infestation of moderate intensity burn areas and fire suppression related disturbances within the perimeter of Davis Fire. Protect and preserve existing high quality plant communities and values.

Year One

1. Identify and map all existing noxious weed populations within and adjacent to the fire.

2. Assess current noxious weed EA and relevant treatment plans, initiate NEPA as required.
3. Contact, and develop a cooperative weed treatment plan with all adjacent landowners, federal, state, county, and private.
4. Project seed maturation of populations, base treatment plans accordingly.
5. Assess fire severity to populations within the perimeter of the fire to determine viability of seed, treat as needed.
6. Hand-pull, bag, remove, and properly dispose of scattered, smaller, existing populations noted along roadways, especially spotted and diffuse knapweed. Focus on interior populations, roads, and adjacent fire boundary populations.
7. Identify potential and existing vectors of both noxious weeds and other invasive species.
8. Implement road closures to help prevent spread of noxious/invasive species.
9. Continue use of washing stations, especially of vehicles and equipment directly involved with weed and fire suppression work.

Year Two

Objectives: Begin a multi-agency coordinated weed treatment plan. Aggressively treat established populations of noxious weeds, prevent expansion. Survey for and treat new noxious weed sites as needed.

1. Begin EA approved noxious weed herbicide treatments. Treat both interior populations, and exterior populations. Implement cooperative landowner agreements to treat noxious weeds with herbicides.
2. Begin effectiveness monitoring of herbicide treatments.
3. Patrol, monitor, and treat noxious weeds that occur on dozer lines, hand-lines, safety zones, drop points, staging areas, roads, campgrounds, and high intensity burn areas. Focus on areas adjacent to known noxious weed populations, both interior and exterior.
4. Enforce road closures to help prevent spread of noxious/invasive species.

Year Three

Objectives: Continue to aggressively treat established populations of noxious weeds, prevent expansion. Survey for and treat new noxious weed sites as needed.

1. Continue EA approved noxious weed treatments. Continue to build and strengthen cooperative long-term noxious weed treatment plans.
2. Continue effectiveness monitoring of weed treatments.
3. Continue to survey and treat as needed initial treatment areas, dozer lines, hand-lines, safety zones, drop points, staging areas, roads, campgrounds, and high intensity burn areas. Focus on areas adjacent to known noxious weed populations, including new populations documented during year two, both interior and exterior.
4. Continue to enforce road closures to help prevent the spread of noxious/invasive species.

Conclusions: Year 1 will be primarily defensive. Prevention of current documented noxious weed populations from setting seed (hand pulling) and spreading into the Davis Fire is critical. Several peripheral populations and a small number of documented interior sites must not be allowed to seed. Fires and fire suppression activities create ideal seedbeds. Left untreated and

given the proximity of known weed sites to areas of moderate burn intensities, fire suppression activities, and open roads, extreme spread rates and densities can be anticipated.

Year 2 and 3 may see herbicide use. Aggressive surveying is critical to locate, document, and treat new sites. Continued treatment of existing sites will help to prevent further increases, and further diminish the potential for spread.

This will be an important two-year period to locate and treat first year spotted knapweed plants, and any other noxious weeds before they become established.

Survey and Manage Species:

Recommendations

- Survey and monitor existing populations of *Tritomaria exsectiformis* along Ranger Creek for impacts related to the fire.
- allow natural recovery of riparian vegetation and monitor.
- Monitor recovery and persistence of *Tritomaria exsectiformis*.

Seeding

Peter Sussmann (Davis Fire BAER team, Deschutes NF Soil Scientist), Maret Pajutee (Cache Mountain BAER Team, District Ecologist, Sisters Ranger District) and others were consulted regarding recommendations for seeding in the Davis Fire area. Their responses were quite emphatic that seeding would not be necessary to prevent erosion and could potentially inhibit or delay the natural recovery of native understory vegetation in the fire area. Sussmann's BAER Soil report indicated that the potential for erosion in the fire area is low and fine roots associated with burned shrubs are present within 1-2 cm of the surface indicating that little damage has occurred to soil seed banks and underground vegetative propagules. Also the potential introduction of persistent, undesirable non-native plants is increased even with certified weed-free seed. In conclusion, these factors, plus the high costs associated with acquiring and applying seed, indicate that allowing natural recovery of native vegetation is the best course of action.

Recommendations

- Monitor the recovery of natural vegetation; collect native grass and forb seeds in areas adjacent to the fire for growout and seed increase (task orders for growout on the Region 6-wide Umatilla contract) for revegetation in the Davis Fire area as needed.

FIRE AND FUELS

Pre-fire Condition

The majority of the Davis burn was in the Davis Late-Successional Reserve. Dense understories and dog hair thickets have created stress on older trees. The vertical continuity of fuels is higher than historical levels and allows fires to develop into understory or crown fires under less severe weather conditions. Average fire intensity is increasing while average fire tolerance of trees has decreased.

Post-fire Condition

The fire burned in a mosaic pattern due to topography, fuels, weather, and suppression actions taken. A large percentage of the fire was intense enough to kill either the majority of trees in a stand or the entire stand. The major mortality on the lodgepole flats and west side of Hamner Butte and Davis Mountain occurred on June 28, 29, and 30, while the fire was plume-dominated and making major runs up the west side of Hamner and Davis mountains along Highway 46 and up Forest Road 62.

Burnout operations on July 1st and 2nd resulted in scattered high, moderate, and low intensity fire with related mortality. The fire behavior was very active and flame lengths were reported at 50+ feet (not to be confused with flame heights or the explosive gasses igniting in the column). Spotting was reported at over a quarter mile. There were numerous fire whirls, one of which was over 100' wide and observed by many people on different parts of the fire.

The crowns were continuous over much of Davis Mountain in the nesting roosting and foraging (NRF) habitat.

The continuous crown created crown fires that were dependent and independent of ground fires with large-scale high intensities and hampering suppression actions.

Preliminary reconnaissance indicates that the fire did not act as a thinning agent, but tended to kill the majority of the trees in the under and overstory. There were very few areas where the fire thinned a stand. Within plantations, the trees were sometimes killed because of heavy fuel loadings from precommercial thinning slash.

The fire will have both short and long lasting effects upon the fuels in the fire area. Most areas that experienced high intensity fire will not have sufficient ground fuel to carry a fire in the short term (less than 5 years). In areas with significant crown scorch and where needles are still left on the trees there will be



Lower West Davis



Lodgepole Flats; West Davis Lake Campground

enough needle cast to support a low intensity fire with low fuel loading. Within 5 years there should be sufficient forbs, shrubs, and grasses to carry a fire with estimated fuel loadings of 3 tons per acre



Burnout Operations Hamner Butte

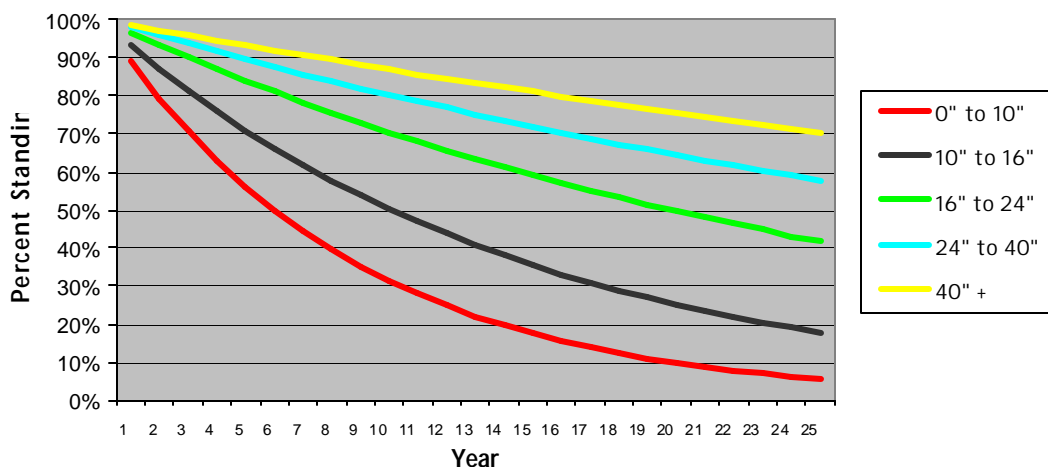


Burnout Operations North Davis Mountain

and a fuel bed depth of <2 feet. Fires in this fuel type will likely spread quickly with rates of spread greater than 32 chains per hour and moderate to high fire intensities.

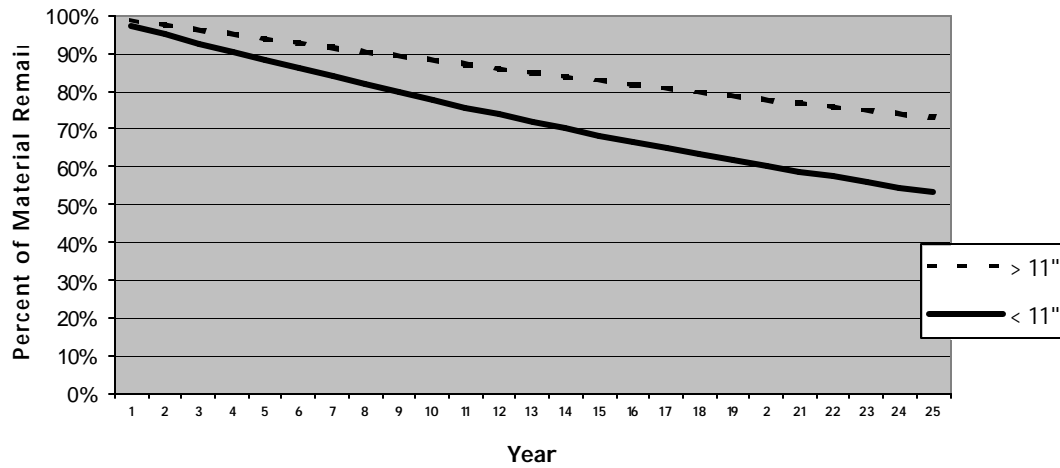
The accumulation of fuel over the next 25 years has been modeled in selected stands representative of the general condition of the project area. The chart below demonstrates the snag fall rates for each of the size classes using the snag fall rates from the Snagfall submodel of the SNFP Growth and Yield Model (Wilson 1999). This calculation was also used to predict the potential snags standing in the respective years listed. The snag fall rates do not take into account different species, as this resolution of data is not available.

Snag Fall Rates by Size Class



Decay of fallen material was also taken into account in predicting the potential surface fuel buildup. The decay rates were also taken from the Snagfall submodel of the SNFP Growth and Yield Model (Wilson 1999) and apply to material in two size classes: less than 11" in diameter and greater than 11" in diameter. These decay rates correspond roughly to half-lives of 20 and 40 years for the small and large material, respectively. The chart below demonstrates the decay of material from year 1 to year 25.

Decay Rates



The following table is the estimated fuels for early, mid, and late seral stands. This represents only dead and dying trees; not regenerating brush, shrubs, forbs, and trees.

Early Seral	Year from fire	Snag fall	Total tons on ground
	1 (2004)	121	7.57
	5 (2009)	379	31.47
	10 (2013)	302	50.76
	15 (2018)	186	62.3
	20 (2023)	116	68.87
Mid Seral	Year from fire	Snag fall	Total tons on ground
	1 (2004)	29	10
	5 (2009)	102	45.23
	10 (2013)	103	80.18
	15 (2018)	83	107
	20 (2023)	66	127.37
Late Seral	Year from fire	Snag fall	Total tons on ground
	1 (2004)	43	11.12
	5 (2009)	143	49.9
	10 (2013)	127	87.76
	15 (2018)	89	116.52
	20 (2023)	66	138.27

Recommendations

- Standing dead trees should be removed to the greatest extent possible to reduce future fuel loading.
- If roads and trails are blocked by fallen timber, access for fire suppression equipment and personnel may be a significant factor in meeting containment efforts.
- Some of the openings created by the fire should be retained in order to break up continuity of the forest.
- Planting of fire tolerant species should be considered to bring the stands back to a more historical regime. Planting spacing should be considered at greater than 15' spacing with a recommendation of 20-30' spacing. This will reduce the chances of catastrophic wildfire destroying future plantations and allow for greater ease of fuels treatments and reduced potential for crown fire through the life of the stand. This will give us the opportunity to reintroduce fire into the ecosystem. Prescribed burning should be used at 5-8 year intervals to help prevent future build-up of fuel loading and stop the spread of less fire tolerant species from invading into these stands.
- All slash from precommercial thinning and ladder fuel reduction should be treated. This will create lower fire behavior and less severity.
- The fire effectively removed most of the ground fuels and the fire should act as an effective firebreak for 5-10 years.

Monitoring

An opportunity exists to monitor how rapidly fuels begin to accumulate in areas of the fire under different severities and intensities. We need to monitor the encroachment of lodgepole pine into the mixed conifer and ponderosa, sugar, and white pine stands. This will determine what kind of management will be needed to maintain these stands lodgepole free.

RECREATION

Pre-Fire Condition

Prior to the Davis Fire, the area in and around Davis Lake provided a wide variety of recreational opportunities. These included hiking, dispersed and developed camping, hunting, mountain biking, fly fishing, bird watching, boating, cross country skiing and snowmobile use.

East and West Davis campgrounds were the two developed campgrounds that were inside the fire perimeter, along with .5 mile of trail between the campgrounds and 3.6 miles of the Metolius/Windigo Horse Trail. The campground trail included a 100 ft. wooden bridge that had been built to provide access across Odell Creek. This bridge was also destroyed.

Developed Recreation

Post-Fire Condition

West Davis campground sustained significant damage.

Items that were destroyed consisted of:

- Approx. 100% mortality of trees
- 18 of 22 picnic tables burnt
- Campsite markers w/numbers
- Informational signs
- 2 bulletin boards
- 1000 treated barrier posts
- 500 linear feet of barrier logs
- The two new CXT toilets, installed last year received damage. Windows, vents, and doors will need to be replaced prior to opening.



Fire Damage at West Davis Campground

East Davis Campground lost a ¼ to ½ of the sites. Items that were destroyed consisted of:

- 50-60% mortality of trees
- Approximately 4 of 33 picnic tables burned.
- Informational signs
- Campsite markers w/numbers
- 101 treated barrier posts
- 100 linear feet of barrier logs



Fire Damage at East Davis Campground



The trail between East and West Davis Campgrounds lost directional signs, and the bridge crossing Odell Creek was severely damaged and is no longer passable.

Lava Flow Campground is the only developed site on Davis Lake that did not burn. The 850 spur on the south entrance of Lava Flow campground was burnt. The area affected was approximately $\frac{1}{2}$ mile on the lake side and 1 mile on the east side of the road. The fire did not reach the first camping area or the boat launch. No restroom structures were lost. It is a priority to reduce the fuel loading around the camping areas and along the access roads. Installation of metal fire rings would also reduce the risk of a fire spreading. The south entrance will need to be assessed each year prior to opening the gate to remove hazard trees.

Recommendations

- An option would be to reconstruct West Davis Campground within a two to five year period.
- Once all of the damaged trees are removed from the campground the area will be replanted with the same species of trees and plants. West Davis provides the best access out of the three boat launches on the lake. Last year new CXT toilets were installed and with minimum repair can be fully functional.
- Another option would be to clear the hazard trees along the north east side of the campground and develop a day use area with boat launch access. A vehicle travel bridge could be built between the two campgrounds that would provide access from East to West Davis without having to drive all the way around to the 4660 road, to gain boat launch access. Incorporate the two campgrounds into one.
- Consideration should be given to diversifying the species mix by including aspen, ponderosa pine, and others.
- The priority is to reconstruct East Davis Campground by spring of 2004. All if not most of the damage is along the 855 road and the access route into the campground. Once all of the damaged trees are removed from the campground the area will be replanted with the same species of trees and plants. The CXT toilet located by the boat launch received damage on one side from a tree falling on the eave.
- Consideration should be given to diversifying the species mix by including aspen, ponderosa pine, and others.
- The trail between East and West Davis should be reconstructed and directional signs replaced. The bridge crossing Odell creek received high damage, and is no longer passable. The retaining barriers along portions of the trail will also need to be replaced. Reroute a small portion of the trail and build a new bridge to cross in a different area along Odell Creek. The old portion of the trail and old burnt bridge will still exist. The area by the bridge could be roped or blocked off and posted with interpretive signs.

- Consider options to expand or utilize all of the sites at the north end of Lava Flow campground to meet demand for recreation use at Davis Lake. This could be an important option depending on the desire or feasibility to transfer/relocate camping use that formerly occurred at East and West Davis campgrounds.

Dispersed Recreation

In the past, dispersed camping was discouraged in sites located along the 600 road and Odell Creek due to wildlife and other resource concerns, primarily through placement of boulders. Now that the area is exposed and all of the natural barriers have been burnt, dispersed use along the Creek will be more difficult to prevent.

I recommend we close the road permanently from the 855 road, (East Davis Campground entrance) to the 4660 road. Closing the road would eliminate reduce the amount of resource damage that could occur, and reduce the risk of someone being injured.

The road from the 850 and 855 junction to the south along the 855 should be blocked off and obliterated. Before the fire came through the Davis Lake area, the trees and brush made a screen that obscured the view of the lake. The lake is now exposed due to 98% of the trees dying. The reason for the closure would be to reduce and mitigate the amount of resource damage incurred by OHV use.

There are three dispersed camping sites located on the Northwest side of Davis Lake; two of those sites had a low severity burn. The only consequence of the low severity burn is the creation of some hazard trees. A dozer line that was created during the fire needs to be rehabilitated as well.

METOLIOUS-WINDIGO TRAIL

3.6 miles of the Met-Win Trail is located within the Davis fire perimeter, the landscape surrounding the trail sustained a high mortality rate. Prior to the fire that portion of the trail was being rerouted due to some resource concerns. The new section of trail was rerouted and flagged this spring and surveys had begun.

The proposed new route needs to be reevaluated to see if it is still the desired location. If this route is used, some mitigation will be needed to reduce the hazards that exist from fire damage. The portion of the trail by Ranger Creek needs to be evaluated for needs to protect natural resources. Signs will need to be posted that say to stay on the trail, no deviation allowed. This trail offers some excellent views of Davis Lake.

Rerouting the Met-Win trail around Ranger Butte could be another option that maximizes the amount of Green Forest the trail could traverse. Leaving the trail in its current location is not preferred. Even though the fire burned through the area, we still have BEMA, Cultural Resources, Endanger plants, and other wildlife concerns. The fire left many of these issues exposed and threatened by public presence.

Recommendations

- Along Ranger Creek there are a couple of dispersed sites, the recommendation for those two sites are to not allow camping. The fire burned through that area, the creek and other resources are exposed and it is also a safety hazard due to all the snags in the area.
- Close the 4660/600 road permanently from 4660/855 to 4660 to eliminate the amount of resource damage that may occur and reduce the risk of injury to recreationists.
- Develop a horse camp at the 4660-096 dispersed camping site, including horse corrals, water source, and restroom facilities.
- On an annual basis, prior to summer recreation activities, the district trail crew should determine the status of the trails, for safety and resource problems.

- The public's enjoyment of the dispersed recreation activities within the burn area will be evaluated through either direct contact with the users and/or through contacts with the districts frontliners, field rangers, and recreation staff.
- Installation of interpretive materials should be a priority to provide the public with information on the Davis Fire 2003.
- If the area closure remains in effect until next year, additional Forest Protection Officers will need to be in place to educate the public of the safety hazards.
- Proper signing informing the public of the fire closure will need to be in place before the decision is made to open Lava Flow Campground for public use. An amendment will need to be made to the current closure to include No shoring allowed on the other areas of Davis Lake except for Lava Flow Campground

SCENERY

Pre-Fire Condition

Scenic Views management areas are located across the Davis Fire area along major travel routes, and in the mid-ground on the buttes. The fire perimeter takes in the following Scenic Views management areas:

Retention Foreground	404 acres
Partial Retention Foreground	4 acres
Retention Middle Ground	4 acres
Partial Retention Middle Ground	7860 acres

The Cascade Lakes Scenic Byway (Highway 46) bisects the fire area and most of the corridor is classified as full retention of the foreground scenic views. An important component of the scenery is large trees lining the roadway. Along most of the route within the fire area, there are limited views beyond the foreground. A scenic overlook near milepost 9.6 provides views of peaks to the west across the lodgepole basin where trees were strategically thinned.

Other main roads through the area that may have a public concern for scenery are Forest Roads 44, 62, and 4660. The largest Forest Plan management area within the fire perimeter is Partial Retention Middleground (7,860 acres). This scenic views management area is located on the western and northwestern slopes of Hamner Butte and Davis Mountain.

Post Fire Condition

The intensity within the Partial Retention Middleground management area was mostly high where mortality is 100%. The vegetation will appear blackened across much of the area for many years. The views from major travel routes will be more open where the mortality was high and moderate and the roadside vegetation burned. The tops of the buttes will be visible along most main roads in the area.

The Davis Fire burned across a 4.6-mile stretch of the Cascades Lakes Scenic Byway (Highway 46). The fire intensity along this stretch of the highway was mostly moderate and high. Vegetation has been changed drastically, and the views have been opened up considerably. Approximately 100% mortality is estimated for the high intensity areas and 80% mortality for the moderate intensity.



*Pre-fire view
from the Cascade
Lakes Scenic
Byway
approximately at
Maiden Peak
Viewpoint.*



*Post-Fire view at
Maiden Peak
Viewpoint*

Recommendations

- The scenic impacts in the area should be analyzed using the Scenery Management System
- The viewpoint located on Cascade Lakes Highway provides a good opportunity to include interpretive information on the Davis Fire. Another possible interpretive location is the pull out at the intersection of Highway 46 and County Road 61.
- Special considerations for scenery should be included when conducting salvage operations; minimize the appearance of roads and landings.
- Involve a landscape architect in revegetation activities within developed recreation sites, interpretive sites, or along major travel routes.

CULTURAL RESOURCES

Pre-fire Conditions

Historic and prehistoric archaeological sites within the perimeter of the Davis Fire represent human use of the area for at least the last 5000 years. Lithic scatters with and without flaked and groundstone tools, rock cairns, possible house pit depressions, dugout wooden canoes, cambium peeled trees, and hunting blinds comprise the various prehistoric sites that were previously documented in the area. Historic era sites represent early fur trapping, grazing, and Forest Service administrative use of the area. A fire lookout, a telephone line, a trail, rock cairns, roads, an early ranger station location, and historic debris scatters are examples of the historic site types represented within the fire perimeter.

A total of 27 recorded sites were within the perimeter of the Davis Fire. Four sites are from the historic era, 17 sites are prehistoric in age, and six sites have components of both time frames. Twenty-three of the sites have been evaluated for eligibility to the National Register of Historic Places; 19 of these sites were found to be eligible and four were deemed not eligible. The other four sites have not been evaluated for eligibility and include a series of rock cairns, two lithic scatters with flake tools, and a collapsed cabin structure. In addition, there are some anecdotally reported sites that have never been documented. These include additional lithic scatters and a series of apparent camas ovens.

District records and survey atlases indicate that approximately 30% or 6296 acres within the area of potential effect (APE) for the Davis Fire have been previously inventoried for cultural resources. This includes most of the areas that are considered high probability for the presence of cultural resources. This leaves roughly 70% or 14,885 acres that have never received any inventory level cultural resource surveys within the fire perimeter. Approximately 1500 acres were examined during early mop-up and subsequent suppression reconnaissance efforts. Most of this reconnaissance occurred in areas of previously inventoried high probability, so it is not counted twice.

Inventory surveys have been conducted in various portions of the area in 1982, 1986, 1993, 1996, and 1999. Several sites were included within a project area that resulted in a finding of No Adverse Effect (NAE) in 2001. A cultural resource treatment plan was developed, consulted on with Oregon SHPO, and partially implemented prior to the fire. Not all of the NAE treatments were completed however. Three of the more severely fire-affected sites are part of the NAE project.

Post-fire Conditions

Fourteen of the 27 recorded sites within the fire perimeter were visited as of July 18, 2003. Eleven of the 13 sites that were not visited are mostly within an area that received partial burning, based on observations from a distance. It is presumed from conditions in other areas, that portions of these 11 sites have been burned, with the resulting increase in visibility at those locations. The remaining two sites are in areas that received little or limited burning. In one case, the historic era site was not eligible and had little remaining materials vulnerable to fire. In the other case, the site is not evaluated due to a lack of sufficient information. Unless it had been subject to severe fire conditions (which it, apparently, was not) there would be little impact expected at this site, even with the low severity of fire that may have engulfed it.

Of the 14 known sites that were visited, at least four were found to have impacts from bulldozer lines within or adjacent to site boundaries. Two other sites with historic components suffered from loss of wood structures and artifacts although both were found to have previously unidentified prehistoric components. Another site (telephone line route still marked with ceramic insulators) will lose all remaining integrity when the insulator trees fall since they were all burned. One cambium peeled tree site was largely unaffected, even though there was fire all around it. Perhaps the roadside location saved it, being located just inside the fire perimeter. All of the 14 sites that were either fully or partially burned are affected by the increased visibility. This is a boon for legitimate archaeological survey by Forest Service personnel, but facilitates illegal collection of arrowheads and artifacts. An area closure order was implemented on July 11, 2003, prohibiting any entry to the fire area except by vehicle on perimeter roads and one National Scenic Byway route through the central portion of the fire. Patrols and monitoring may catch some illicit activities.

The other common effect of this fire may not be immediate in nature, but given the loss of vegetation and its ability to hold soils with roots and organic litter on the surface, erosion is expected to develop in those locales where there are slopes of greater than five percent. Loss of soils in archaeological sites is a guarantee that deposits of cultural materials will also be lost. While there will be rapid re-growth by some plant species, others will take longer to re-establish in former habitats. This means that there may be long term effects through erosion, gullying, and loss of site materials.

Nine of the 27 sites were in areas of high burn intensity; one site was in an area of high/moderate burn intensity. Eight more sites were in high moderate to moderate burn intensity areas. Six sites were within a low/moderate burn intensity area and the last three sites were in low intensity burn areas.

During mop-up operations, monitoring by the heritage crew was accomplished in areas of high sensitivity due to the location of previously recorded and anecdotally known sites not yet documented. Bulldozer lines within sites have been noted but are not yet rehabilitated. Guidelines for the least disturbing methods to rehabilitate the new cuts will be carried out under the supervision of the District Hydrologist and District Archaeologist.



Ceramic insulator hanging on burned tree



Unburned culturally peeled ponderosa pine tree

Recommendations, Monitoring, and Evaluation

- There is a high probability that additional new sites will be discovered within the fire perimeter. At least four have already been located. It is anticipated that some existing site boundaries will be enlarged as a result of increased surface visibility. We also expect that some sites may merge with others nearby, for the same reason of increased visibility.
- I recommend that post-fire inventory surveys continue until all high probability areas, especially where known sites exist, are completed. Spot-checks of all new and previously documented sites is also recommended after the first significant period of rain. The reason for this is because visibility is now good due to lack of surface vegetation. The rationale for post-rain surveys is because visibility will again be improved by having the surface ash compacted by the water, leaving behind the heavier items, including cultural materials otherwise obscured by a deep layer of wood ash.
- I recommend that previously unevaluated and all newly identified sites be evaluated for NRHP eligibility. The need for this step is due to the risk of loss from fire effects (erosion, looting, vandalism). Eligible sites should be managed for future research and long-term public benefit. Benefits could include on-site field schools, graduate student research, or public programs such as Passport in Time projects or off-site programs and interpretive products.
- Sites that are vulnerable to serious erosion are recommended for establishing photo points and monitoring them during the next nine months to a year. Three such sites come to mind immediately and these are the same three sites involved with the NAE project that has incomplete site treatments. Some level of coordination of monitoring and conducting NAE treatments can be done, although additional monitoring visits would need to be done since NAE treatments would not take more than a few visits at each site. Monitoring once a month during snow-free periods of the next year would be the minimum recommendation for this work.
- Monitoring a sample of previously determined ineligible sites should also be conducted to determine if additional information is available due to cumulative fire effects.

- The Davis Fire area could also be used as an analysis area for the study of fire effects on cultural resources. Data concerning the effects of fire is a critical element in the development of cultural resource compliance strategies for prescribed and wild fire events. The mosaic character of portions of the Davis Fire and the presence of a variety of cultural resources would provide a unique opportunity to compare and contrast impacts to a variety of site types by different levels of fire intensity.

TRANSPORTATION SYSTEM

Roads

Pre-Fire Conditions

Within the Davis Fire perimeter, there are approximately 187 miles of classified (system) roads. Of those roads, 17 miles are classified as Maintenance Level (M/L) 3, 4, or 5, meaning that they are maintained to be suitable for passenger car use (also known as Highway Safety Act roads). The remainders are either open and suitable for high-clearance vehicles (M/L 2; 98 miles) or have been closed to eliminate vehicular use (M/L 1; 72 miles). Within the fire perimeter, there are an unknown number of unclassified roads, representing old temporary logging logs, historic road segments that had been abandoned, and roads that had been decommissioned and allowed to revegetate.

Many of the M/L 2 roads, especially those on the flanks of Hamner Butte and Davis Mountain, had over time become nearly closed because of encroaching trees and underbrush. Many of the M/L 1 roads and most of the unclassified roads were also heavily vegetated to the point of being indiscernible. Other M/L 1 roads were closed in the recent past as a wildlife and watershed mitigation measure, using 10% Fund money. Most of this work was performed in 1999 and was focused primarily on Davis Mountain and Hamner Butte.

Post-Fire Conditions

Within the areas of high-intensity fire area, there are 153 miles of classified roads, with 16 miles being passenger-car suitable (M/L 3-5); 75 miles are M/L 2 (high clearance), and 62 are M/L 1 (closed to motorized vehicles). Several M/L 1 roads were opened to provide for equipment access during the course of suppression efforts. Unclassified roads that had previously been effectively screened and closed by vegetation have also become visible as a result of the total devegetation in the high intensity burn areas.

A Burned Area Emergency Rehabilitation (BAER) team reviewed potential risks associated with the roads in the fire area. Their report documented little imminent risk to watershed values or human life or property that might result from failed drainage or mass failure of roads owing to the general lack of active drainage systems within the fire perimeter. No specific rehabilitation needs were identified by the team; it was recommended that a small group of arterial and collector routes near Davis Lake and Odell Creek be monitored during higher-intensity rainstorm events to guard against the potential of culverts plugging and diverting high sediment loads into those water bodies.

Recommendations

The following recommendations should be performed as soon as they can practically be done. Most road closure activity will not be able to be performed until mop-up activities have been completed, but every effort should be made to honor the commitment represented by those roads that were closed using targeted appropriated funding (10% Fund).

- Assure that adequate drainage is installed or reinstalled in M/L 2 roads that received significant use during suppression activities.
- Close M/L 1 roads that were opened to facilitate suppression access and reinstall surface drainage to maintain their self-maintaining capability.
- Close unclassified roads that have become open as a result of vegetative removal.

Hazard Trees

Pre-Fire Condition

Hazard trees were randomly found along roads within the area of the Davis Fire. These trees were primarily dead, tall enough to reach the roadbed, and leaning toward the road. Those identified along roads where passenger cars are accepted (Highway Safety Act roads; M/L 3-5) were routinely felled when identified. Other hazard trees along M/L 2 roads were generally not treated with the same timeliness, but were removed when increased activity occurred in their vicinity, usually as the result of timber sale log haul or road maintenance or reconstruction.

Post-Fire Condition

Within the area of high intensity fire, virtually all of the trees along roadsides were killed. As a result, high levels of mortality can be found along the entire 153 miles of roads within the high-intensity fire areas.

During the main suppression effort, and again just prior to demobilization of the bulk of fire-fighting forces, efforts were made to identify and fell hazard trees along Road 46 and the main collector routes providing access through and around the perimeter of the fire. Although this was an extensive effort, it primarily addressed trees that had clear physical signs of weakness, such as burned out or burning trunks or fire-damaged root systems that were readily visible. A significant population of dead trees remains along all roads, including open perimeter roads and Road 46, that meet the hazard tree definition (tall enough to reach the roadbed and leaning toward the road). The actual stability of these dead trees is unknown, even though they display no external evidence of being any more of an immediate safety risk than when they were alive.

Recommendations

- Dead trees meeting the hazard tree definition should be assessed to determine whether they need to be immediately removed. This assessment should focus initially on those roads open

to public travel and focus especially on the larger diameter Ponderosa pine trees that pose the greatest potential risk to public safety.

- Further assessments should be conducted within the area that is currently under closure order, with the initial focus being on Road 62 and the collector routes within the interior of the fire area, such as Roads 6240 and 6230.
- If other resource needs lead to retention of a certain percentage of these newly created hazard trees, they should be monitored on a yearly basis by district timber personnel to ascertain soundness.
- In areas where numbers of trees need to be felled, they should be felled in a manner that will avoid jackstrawing or create concentrations of woody material adjacent to the road.

Travel Management

Pre-Fire Conditions

Within the Davis Fire perimeter, there were 72 miles of closed classified roads in Maintenance Level (M/L) 1 status. Open roads in M/L 2, 3, 4, and 5 comprised the remainder of classified roads in the area.

Although no Travel Management analysis has been done in this area to the level of detail normally called for in the current Roads Analysis process, previous Environmental Analysis (EA) projects addressing this general area have included decisions on road closures. The most recent is the Seven Buttes EA, which produced a list of roads to be closed or decommissioned as funding became available. A large portion of the closed roads in the fire area, primarily on Davis Mountain and Hamner Butte, were developed from this list and closed in 1999 using 10% funds.

Operational Maintenance Level	Total Miles
1 - BASIC CUSTODIAL CARE (CLOSED)	72
2 - HIGH CLEARANCE VEHICLES	98
3 - SUITABLE FOR PASSENGER CARS	10
4 - MODERATE DEGREE OF USER COMFORT	2
5 - HIGH DEGREE OF USER COMFORT	5

Within the areas of high burn intensity, 62 miles of the 153 miles of classified road in those areas were closed and maintained in the M/L 1 category. Most of these M/L 1 roads were closed by berms, logs, and other material to maintain a physical barrier to eliminate motor vehicle use. There were (and are) no access management programs (such as a green dot closure system) and there were no closure orders existing in this area. There was also an unknown number of unclassified roads within the high intensity areas, most of which were effectively screened by vegetation.

Post-Fire Conditions

Within the high-intensity burn areas, virtually all lower-height vegetation has been removed or completely denuded of leaves or needles. Roads that had been effectively screened by that vegetation, whether they be M/L 1 classified roads or unclassified roads, are readily visible; any physical barricades relying on adjacent vegetation to prevent vehicular access (particularly on flatter ground slopes) are now easily defeatable.

A portion of previously closed roads were opened within the fire perimeter during the height of suppression operations and remain open, as do an unknown number of drivable tractor-constructed

fireline. Suppression rehabilitation has been deferred on these roads and firelines in order to facilitate access for on-going mop-up operations.

In addition to rendering visible previously closed (and, in some cases, previously unknown) roads, the high intensity fire removed sufficient ground vegetation and woody material to dramatically open up the countryside surrounding the roads that traverse these high-intensity areas. In many areas this has created the potential to be able to travel more or less freely across the landscape away from roads on off-road vehicles (ORVs) or even high-clearance vehicles in some instances, where such travel would not have been previously possible due to that vegetation and woody material. This same loss of vegetation has also opened up visibility for far greater distances from roads than was previously possible.

A road and area closure was implemented on July 11, 2003, for the Davis Fire area. This closure order limited motorized, mechanized, or foot- or hoof-borne access to the perimeter of the fire area on Roads 44, 4660, 4674, 4680, 62 (to the 4680 jct.), and 6220. Travel is also allowed through the fire area on Rd. 46. Access into the fire area from any of these routes is forbidden.

Recommendations

- The current closure should be maintained, especially within areas of high burn intensity, through the remainder of 2003 and into the summer of 2004. This should be done not only for public safety, but also to minimize the likelihood of ORV activities within the high intensity areas, especially during hunting season when such activities would be more likely to occur.
- A Roads Analysis should be conducted to determine the transportation system that should be in place that will provide for protection of resource values during the early recovery period in high intensity areas.
- Subsequent to cancellation of the current area closure, a travel management plan should be implemented (ideally within the scope of Roads Analysis, but it should be done in any case in the event that a Roads Analysis hasn't been completed). This travel management plan should limit access to arterial and collector roads, along with a few specific local roads, and should generally limit access to local (seven-digit) roads. This plan should be coupled with a forest order prohibiting operation of any motor vehicle or ORV (excluding snowmobiles) off of existing open classified roads within the high-intensity burn areas.
- As ground vegetation recovers and big game begin to move back into high intensity burn areas for forage, consideration should be given to implementing seasonal road closures. Loss of mature existing vegetation has tremendously opened up lines of sight off of existing roads; the lengthened lines of sight may lead to unacceptably high levels of hunter depredation on deer and elk. Implementation of seasonal access restrictions through means such as a "green dot" travel management system would mitigate this depredation to a certain degree.
- Other seasonal or year-round closures should be given consideration in other areas of concern, such as along Odell Creek or in the vicinity of the elk calving area to the south of Davis Lake.

